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March 1994

US Army Corps
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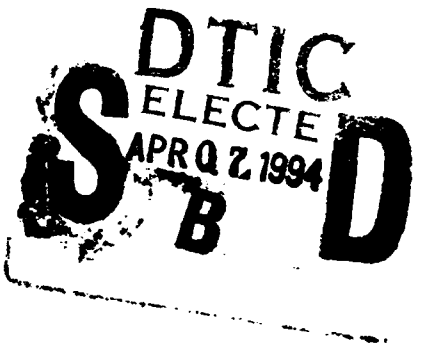
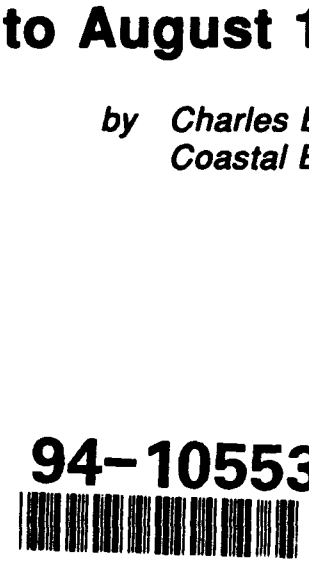
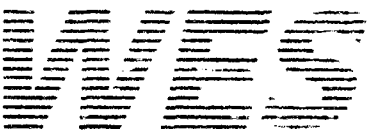
Waterways Experiment
Station

Index and Bulk Parameters for Frequency-Direction Spectra Measured at CERC Field Research Facility, September 1989 to August 1990

by Charles E. Long, Wendy L. Smith
Coastal Engineering Research Center







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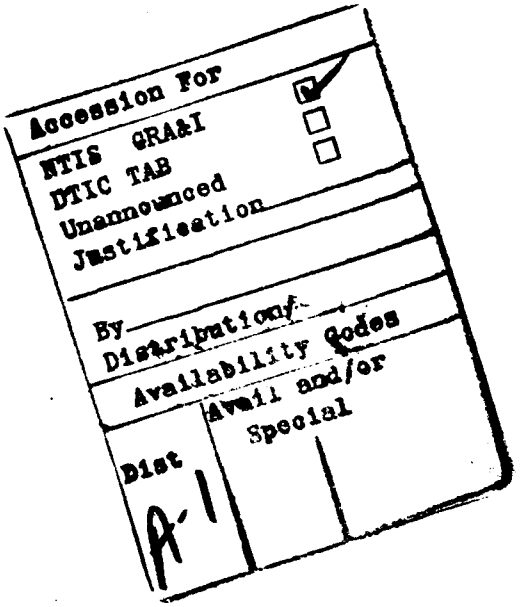

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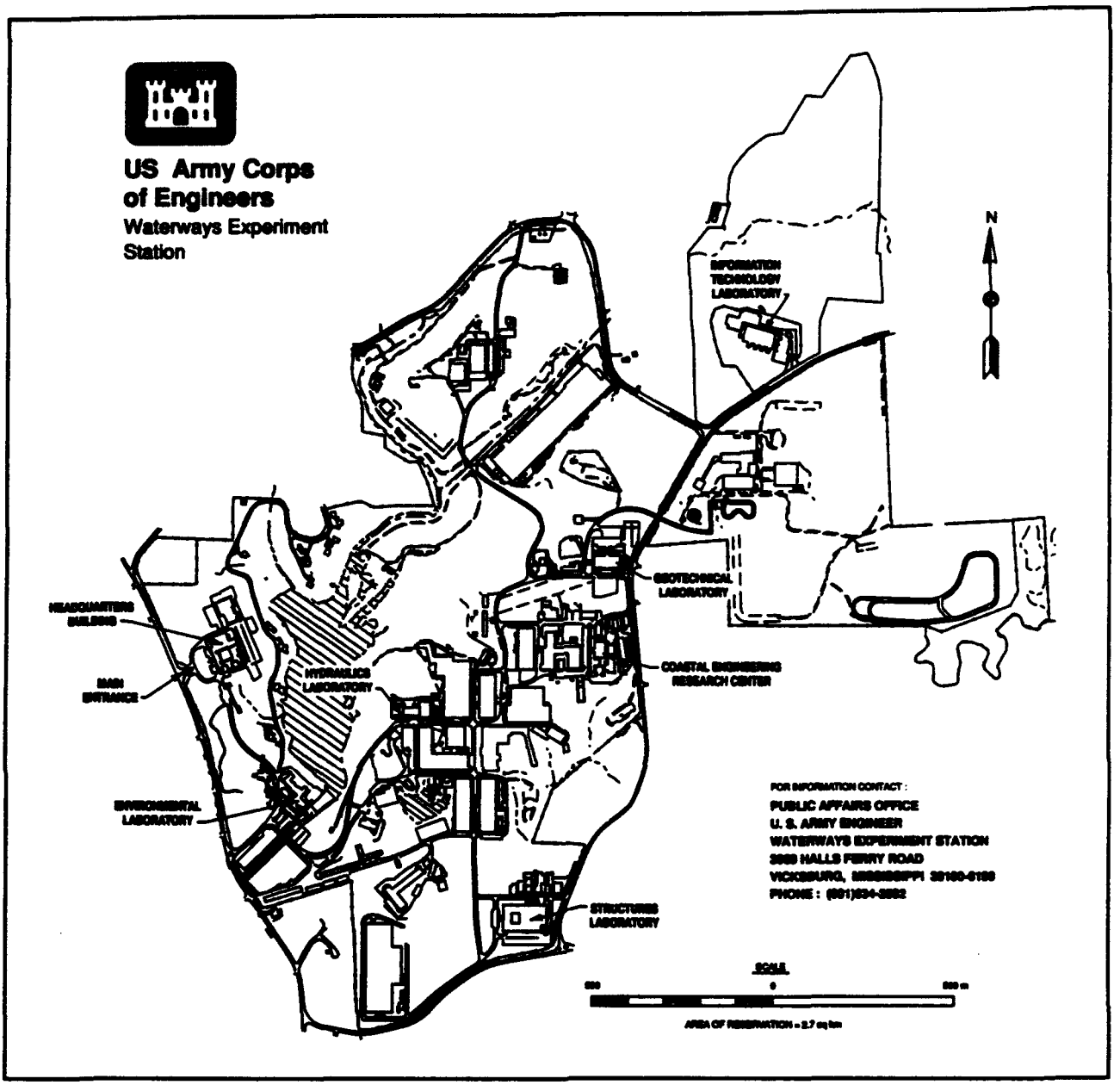

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Contents

Preface

This report indexes and describes means of access to a series of wind-wave frequency-direction spectral observations made with a special, high-resolution directional wave gauge. The work was motivated by a paucity of observations of directionally distributed wave energy, which has hindered understanding and modeling of the nearshore processes that affect coastal engineering projects. This effort was authorized by Headquarters, U.S. Army Corps of Engineers (HQUSACE), under Civil Works Coastal Flooding Program Research Work Unit 32484, "Directionality of Waves in Shallow Water." Funds were provided through the Coastal Engineering Research Center (CERC), U.S. Army Engineer Waterways Experiment Station (USAEWES), under the program management of Ms. Carolyn M. Holmes, CERC. Messrs. John H. Lockhart, Jr., John G. Housley, Barry W. Holiday, and David A. Roellig were HQUSACE Technical Monitors.

This summary report was prepared by Dr. Charles E. Long from data processed and archived by Ms. Wendy L. Smith, a student contracted through the Cooperative Education Program at Old Dominion University, at CERC's Field Research Facility (FRF), Duck, NC. Work was performed under the direct supervision of Mr. William A. Birkemeier, Chief, FRF, and Mr. Thomas W. Richardson, Chief, Engineering Development Division, CERC; and under the general supervision of Dr. James R. Houston and Mr. Charles C. Calhoun, Jr., Director and Assistant Director, CERC, respectively.

The directional wave gauge and its data processing software were designed by Dr. Joan M. Oltman-Shay while at Oregon State University working through an Intergovernmental Personnel Agreement. This work would not be possible without continued physical maintenance of the directional wave gauge. This was done by the FRF dive team consisting of Messrs. Birkemeier, Michael W. Leffler, H. Carl Miller, Eugene W. Bichner, and Brian L. Scarborough. Gauge calibration was maintained by Mr. Kent K. Hathaway, FRF. Acquisition, monitoring, and storage of raw data were done by Mr. Clifford F. Baron, FRF.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

1 Introduction

The range and magnitude of forces due to ocean waves in the so-called wind wave frequency band (roughly 0.04 to 0.3 Hz) are of importance to an engineer estimating the durability of a natural boundary or designing a modification to such a boundary. Such waves are among the dominant forcing mechanisms in all coastal processes. Estimation of wave forces requires knowledge of the sea state in the region of interest. Description of a sea state requires, at a minimum, an amplitude, a frequency, and a direction for each component of the wave field. Historically, there have been many observations of wave amplitude and frequency but very few detailed observations of wave direction, due primarily to additional technical requirements in making such measurements. This represents a distinct and very important void in the knowledge required for comprehensive engineering design.

In September 1986, to begin to alleviate this dearth of knowledge, the Field Research Facility (FRF) of the Coastal Engineering Research Center (CERC), U.S. Army Engineer Waterways Experiment Station (USAEWES), installed a high-resolution, directional wave gauge consisting of a linear array of pressure gauges for long-term observations of nearshore directional wave climate at its site near Duck, NC (Figure 1). Data thus obtained, which take the form of wave frequency-direction spectra, are intended for use by the broadest possible group of researchers and application engineers and have been archived in a simple form of database. This report is intended to simplify dissemination of these data by indexing and describing means of access to the set of observations collected during the fourth year of deployment. Similar indexes for the first 3 years of deployment are reported by Long (1991a, 1991b) and Long and Smith (1993).

The beginning text of this document is intended to describe and clarify the substantial information contained in the appendixes. Brief overviews are given of the measurement site, instrumentation, data collection, and method of directional spectral estimation. These subjects are described in greater detail in other publications, to which the reader is referred. Following the overviews is a description of the archived frequency-direction spectra and some characterizing bulk parameters that can be derived from them. Appendix A is a listing of these characterizing parameters and is intended to be used as a kind of catalog of the set of spectra. Appendix B contains graphs of time series of some of these parameters as a pictorial augmentation of the information in Appendix A. Appendix C illustrates a FORTRAN computer program

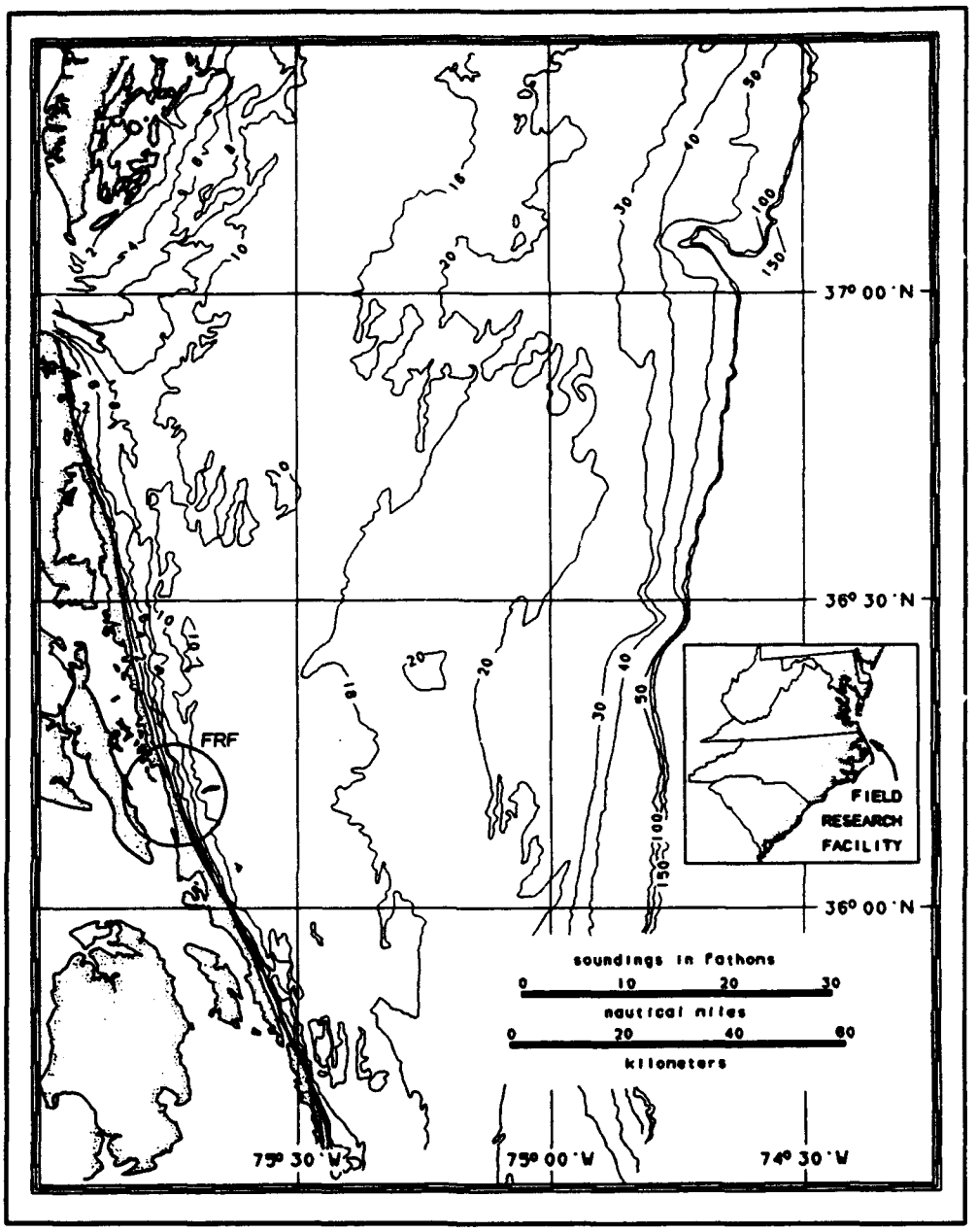

Figure 1. Location and offshore bathymetry of the FRF

that can be used to read archived data, of which a sample listing is given in Appendix D.

2 Field Research Facility

As shown in Figure 1, the FRF is located on the barrier island chain of coastal North Carolina. A detailed description of the layout, function, and capabilities of the FRF is given by Birkemeier et al. (1985). Of particular relevance to directional wave studies are the wave-steering bathymetry and wave-generating winds.

Bathymetry

Regarding bathymetry, the coastline in the vicinity of the FRF is nearly straight for several tens of kilometers north and south (Figure 1). It is oriented such that a shore-normal line (directed seaward) is very nearly 70 deg from true north. Waves and onshore winds can approach this site along an easterly 180-deg arc from 340 to 160 deg true. The adjacent continental shelf is wide, relatively shallow, and of somewhat complex bathymetry. The direction of nearest approach of the 100-m isobath, which indicates the shelf break, is 10 to 15 deg south of east and is about 80 km distant. A typical bottom slope for the shelf is 1 m/km, but this is interrupted by numerous features of 1- to 10-km horizontal scales and 10-m vertical scales scattered irregularly across the shelf.

Within a few kilometers of the FRF, the offshore bathymetry is more regular, with isobaths nearly shore-parallel and a bottom slope of about 2 m/km (Figure 2). Some irregularities exist. Within about 300 m of the shore, there exists a complex and mobile bar system (Birkemeier 1984). Waves and currents have created some irregular bathymetry in the vicinity of the FRF research pier, which extends about 600 m offshore (Miller, Birkemeier, and DeWall 1983).

Wave-Generating Winds

The site is subject to a variety of climates, which gives rise to a diverse set of directional wave conditions. Primary sources of high-energy waves are winds associated with hurricanes and frontal passages. Though no hurricanes passed directly over the FRF during the period covered by this report, two hurricanes (Gabrielle and Hugo) passed near enough that significant wave energy was measured at the FRF. Low-pressure weather fronts, of which several crossed the FRF site during this reporting year, were typically

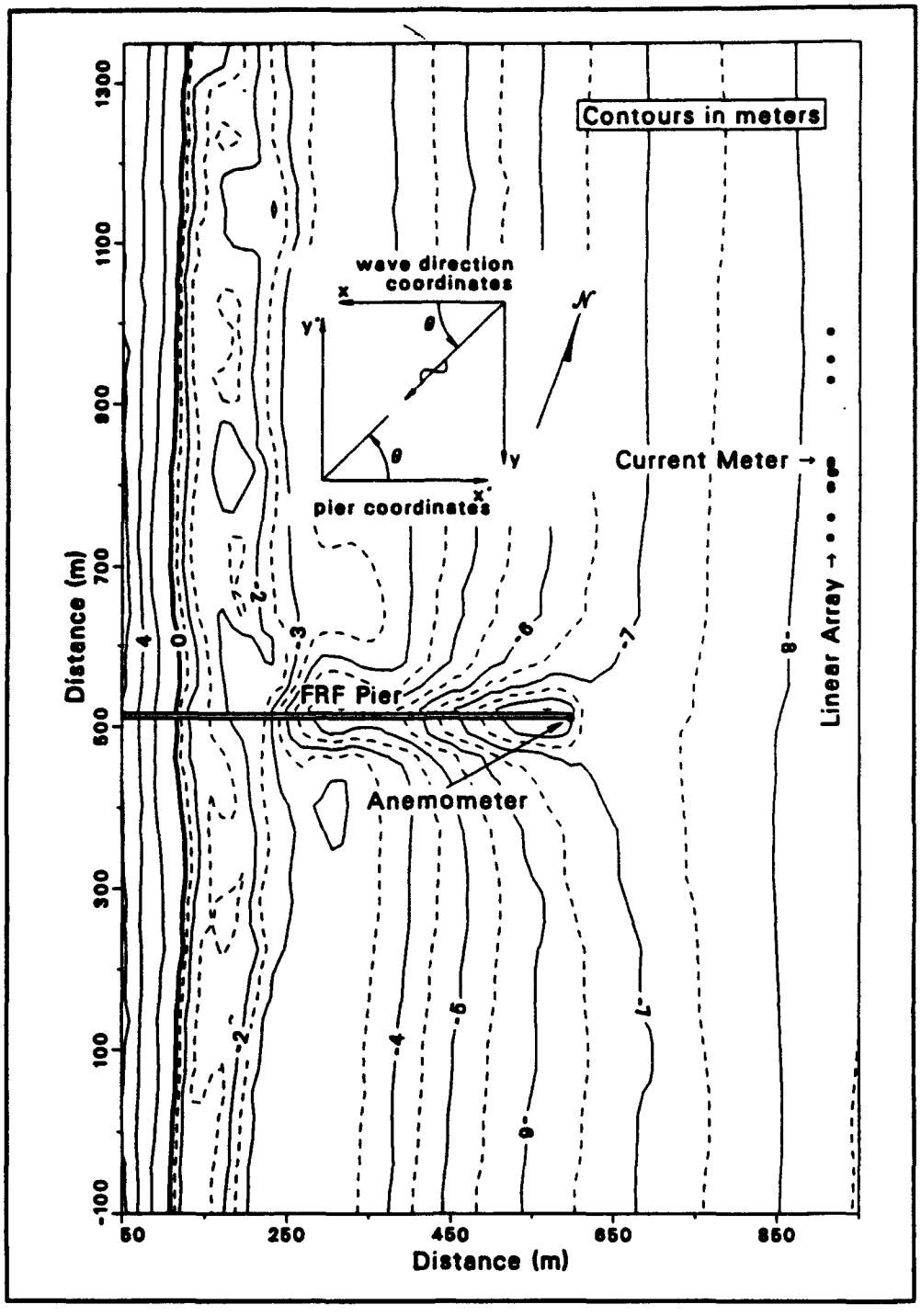

Figure 2. FRF nearshore bathymetry and coordinate system

oriented northeast-southwest, with strong wave-generating winds coming from the northeast. Detailed, quantitative descriptions of the climate at the FRF, as determined from its arsenal of instrumentation, during the period covered by this report are given by Leffler et al. (1991, 1992).

3 Instrumentation

The primary instrument in this study is a high-resolution directional wave gauge. It consists of two parts. The first is a linear array of sensors that sample sea-surface displacement at several points in (horizontal) space. The second, described in the following section on data processing, is the mathematical treatment of these data to obtain estimates of wave directionality.

The FRF array consists of nine pressure gauges mounted approximately 0.5 m off the bottom along the 8-m isobath about 900 m offshore and to the north of the research pier (Figure 2). Its location satisfies three constraints. First, it is generally outside the surf zone so that linear wave theory is applicable in data processing. Second, it is in water shallow enough that signals from 3-sec waves, the shortest periods of interest here, are detectable above background noise at the bottom-mounted gauges. Third, it is located away from the irregular isobaths around the pier and in the nearshore bar system, which helps minimize bathymetrically induced inhomogeneities in the wave field.

Spacing between the gauges along the linear array appears irregular in Figure 2 but, for the most part, corresponds to the array-design criterion posed by Davis and Regier (1977) that every gauge pair has a unique separation. Figure 3 is an enlarged view of the array layout and shows gauge spacing as well as the gauge numbering scheme. Gauge 10 is not used in linear array analysis but is used in error checking. Minimum gauge spacing is 5 m, maximum spacing (the length of the array) is 255 m, and intermediate gauge

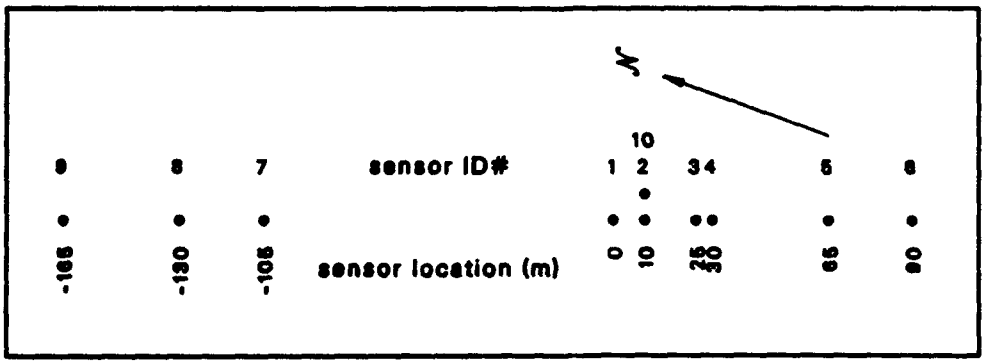

Figure 3. Spacing and numbering of linear array gauges

spacings are in multiples of 5 m. With nine gauges, there are 36 possible unique spacings. In the FRF array, eight redundant spacings are intentionally left for ancillary examination of spatial homogeneity of the wave field. Twenty-eight unique spacings remain.

Each pressure gauge is a Senso-Metric Model SP973(C), in which a piezoelectric strain gauge detects displacement of a pressure-sensitive diaphragm referenced to an evacuated cavity. Site calibrations indicate an accuracy of the pressure equivalent of ± 0.006 m of water for wave-induced fluctuations about a static water column height of 8 m. Voltage analogs of pressure signals are hard-wired through a 10-Hz, fourth-order, Butterworth filter (primarily to eliminate 60-Hz noise) to an analog-to-digital signal converter and then to a Digital Equipment Corporation VAX 11/750 computer for data acquisition. Discretization of the full-scale signal to 11-bit binary form results in a digitization step of the equivalent of 0.007 m of water, which is nearly the same as gauge accuracy.

4 Data Collection

Signals from each of the nine pressure gauges were sampled at 2 Hz and stored digitally as records of 4,096 points (34 min 8 sec). A normal collection consisted of four such records or 16,384 points (2 hr 16 min 32 sec) for each gauge. Hence, a total of 147,456 data points were collected to produce one frequency-direction spectrum. Starting times for normal collections are the same as those for routine FRF observations (Birkemeier et al. 1985), which occur daily at 0100, 0700, 1300, and 1900 hr Eastern Standard Time (EST). At times of high energy or when specifically requested by an investigator, additional daily collections occur at 0400, 1000, 1600, and 2200 hr EST.

During the period covered by this report, a total of 1,505 frequency-direction spectra were obtained. A list of data collection start times for these observations is given in Appendix A. Appendix B contains time-series plots of spectral parameters with winds and currents as auxiliary environmental variables. Locations of reference anemometer and current meter are shown in Figure 2.

5 Data Processing

Conversion of measured time series to estimates of frequency-direction spectra requires products of frequency spectral estimates from the nine gauges in the array. For final results to be accurate, raw input data must be of exceptionally high quality so that spiky or drifty data from one gauge do not contaminate products of results from the other eight gauges. Hence, the procedure for data processing is to check raw data for errors, estimate a frequency-direction spectrum, and then compute some bulk parameters with which to characterize results.

Error Checking

Because multiple gauges were deployed in what was assumed to be a uniform sea, certain statistical properties of raw data from the nine gauges should be identical. Hence, properties of data from these gauges can be intercompared to isolate bad gauges. Two types of properties were used: (a) integral, requiring summing of data, and (b) extremal, derived from maximal and minimal characteristics of a time series. Integral properties used were mean value, standard deviation, skewness, (excess) kurtosis, and trend. Extremal properties were maximum and minimum values, first derivatives, and second derivatives of pressure time series. Reference values were then established for each property. Except for skewness and kurtosis, which have expected values of zero, reference values were the medians of each property determined from the nine gauges of the linear array plus the tenth gauge shown in Figure 3. If a property of any gauge deviated from the reference value by more than a preset, empirically determined amount, it was flagged as being suspect, and the data were then further examined by hand to ensure that the flagging procedure had indeed identified a malfunctioning gauge. A more detailed description of the error-checking procedure is given by Long and Oltman-Shay (1991).

If a gauge malfunctioned, it was not used in further analysis. The analysis programs were written so that data from a subset of gauges could be analyzed. Using fewer gauges results in reduced directional resolution, with some gauges being more critical than others. If either of the two gauges with the smallest spacing is lost, results are invalid at high frequencies due to aliasing. In these cases, directional analysis was truncated at a lower high-frequency limit (generally 0.24 Hz instead of the normal 0.32 Hz). If either of these two

were not lost, a full analysis was done. For the data set described here, there were never fewer than six functioning gauges in the linear array.

To keep track of the set of functioning gauges, a parameter called the gauge pattern was created and stored with the results for each collection. The gauge pattern is a nine-place character string that represents the linear array gauges in order of placement. Each place in the string contains the gauge number if the gauge was functioning properly or a minus sign (-) if the gauge was not used in analysis. This parameter can be of use in later analyses for assessing the directional resolving ability of a reduced array.

Frequency-Direction Spectra

Estimation of the frequency-direction spectrum is done in four parts. First, time series of pressure data from each gauge are Fourier transformed to the frequency domain. Second, these transforms are converted to sea-surface displacement transforms. Third, cross spectra of sea-surface displacement are computed between all unique gauge pairs for each frequency. Finally, an estimate is made of a directional distribution of wave energy that corresponds to the computed spatial variation in cross-spectral density for each frequency.

The Fourier transform is conventional. A 16,384-point time series is divided into 15 half-overlapping segments of 2,048 points. Segments are tapered with a Kaiser-Bessel window (a modified Bessel function of the first kind, compensated uniformly for loss of variance due to windowing) and fast Fourier transformed. An intermediate-resolution transform is found by averaging the 15 transformed segments, frequency by frequency. Final transforms are found by then averaging results over 10 adjacent frequency bands. Final resolution bandwidth is 0.00976 Hz, and degrees of freedom are at least 150 (assuming eight contiguous segments and ignoring any gain from lapped segments). Transform estimates are retained for 28 frequency bands with band-center frequency ranging from 0.054 to 0.318 Hz.

Conversion of pressure signals at depth to water-surface displacement is done through the linear wave theory pressure response factor as described in the *Shore Protection Manual* (SPM 1984). After this conversion, complex cross spectra in the form of coincident and quadrature spectra are computed in the conventional way (Bendat and Piersol 1971; Jenkins and Watts 1968) between all unique gauge pairs. Cross-spectral estimates at a given frequency are then ordered in terms of gauge separation distance, or lag space, in preparation for directional spectral estimation at that frequency.

Conversion of cross-spectral patterns in lag space to directional spectra is done with the Iterative Maximum Likelihood Estimation algorithm derived and described by Pawka (1982, 1983). The algorithm is also described in application to data from heave-pitch-roll buoys by Oltman-Shay and Guza (1984). Accuracy of directional estimates depends on frequency, with high-frequency waves (short wavelengths) being better resolved by an array of finite length. Tests with artificial data indicate that the FRF array generally can resolve the direction of a unidirectional wave train to within 5 deg and can distinguish

two wave trains at the same frequency if their directions differ by at least 15 deg.

The algorithm used here yields discrete direction "bandwidths" or arcs of about 0.5 deg for 0.318-Hz waves to about 3.5 deg for 0.054-Hz waves. It is convenient to have direction increments the same for all frequencies so that a regular array can be used to represent the full frequency-direction spectrum. As a trade-off between the two discrete arc-width extremes, directional results were integrated over 2-deg arcs and renormalized with this arc width to create evenly spaced directional spectra at all frequencies. By nature, linear array results have a 180-deg ambiguity in directional detection. It is assumed here that most wind wave energy propagates onshore and that an insignificant amount of energy propagates offshore. Directions of interest are then in the 180-deg arc representing seaward approach directions. Dividing this range into 2-deg arcs results in 91 arc center directions with which to characterize discretely the directional distribution of wave energy at a given frequency.

The primary result of data processing is an estimate of the discrete frequency-direction spectrum $S(f_n,\theta_m)$, which represents the variance of sea-surface displacement per frequency resolution bandwidth df (= 0.00976 Hz) per direction resolution arc $d\theta$ (= 2 deg), where f_n is the n^{th} of $N = 28$ discrete frequencies and θ_m is the m^{th} of $M = 91$ discrete directions.[1] In this work, direction is considered to be the angle from which wave energy is coming, measured counterclockwise from shore-normal (Figure 3).

Numerical values of $S(f_n,\theta_m)$ can range over many orders of magnitude, depending on the amount of energy in a given frequency band and direction arc, and this can require space-consuming formats for archiving data. To simplify this problem, frequency-direction spectra can be saved in the form of directional distribution functions $D(f_n,\theta_m)$ defined by

$$D(f_n,\theta_m) = \frac{S(f_n,\theta_m)}{S(f_n)} \tag{1}$$

where $S(f_n)$ is the frequency spectral density at frequency f_n. The directional distribution function has units of deg^{-1}, and its integral with respect to direction over all directions is unity.

The frequency spectrum in Equation 1 represents the sum over all directions of sea-surface variance per frequency bandwidth and is defined in terms of the frequency-direction spectrum by

$$S(f_n) = \sum_{m=1}^{M} S(f_n,\theta_m)\, d\theta \tag{2}$$

---

[1] For convenience, symbols and abbreviations are listed in the notation (Appendix E).

where the variables on the right-hand side are defined in the second preceding paragraph. Note that this is identical to a conventional frequency spectrum that would result from a time series of sea-surface displacements at a single point in space. Because it is an integral of the frequency-direction spectrum, it is called the integrated frequency spectrum.

A directional analog of the frequency spectrum is the integrated direction spectrum, found by summing the frequency-direction spectrum over all frequencies for a fixed-direction arc. It is computed from

$$S(\theta_m) = \sum_{n=1}^{N} S(f_n,\theta_m)\, df \tag{3}$$

Figure 4 shows one way to display the frequency-direction spectrum and the corresponding integrated frequency and integrated direction spectra.

Bulk Parameters

Several parameters have been computed to characterize the observed spectra. There are four basic types of parameters: (a) characteristic wave height, (b) peak frequency (or its inverse, peak period), (c) peak direction, and (d) directional spread. Because there is more than one way to define some of these parameters, several alternate forms are presented here.

Characteristic wave height

Characteristic wave heights from spectral observations are most frequently given as H_{mo}, which is four times the standard deviation of sea-surface displacement. It can be determined from the volume under the frequency-direction spectrum by the equation

$$H_{mo}^2 = 16 \sum_{n=1}^{N} \sum_{m=1}^{M} S(f_n,\theta_m)\, df\, d\theta \tag{4}$$

It can also be found from the integrated frequency spectrum by

$$H_{mo}^2 = 16 \sum_{n=1}^{N} S(f_n)\, df \tag{5}$$

which is its more conventional definition, or from the integrated direction spectrum by

$$H_{mo}^2 = 16 \sum_{m=1}^{M} S(\theta_m)\, d\theta \tag{6}$$

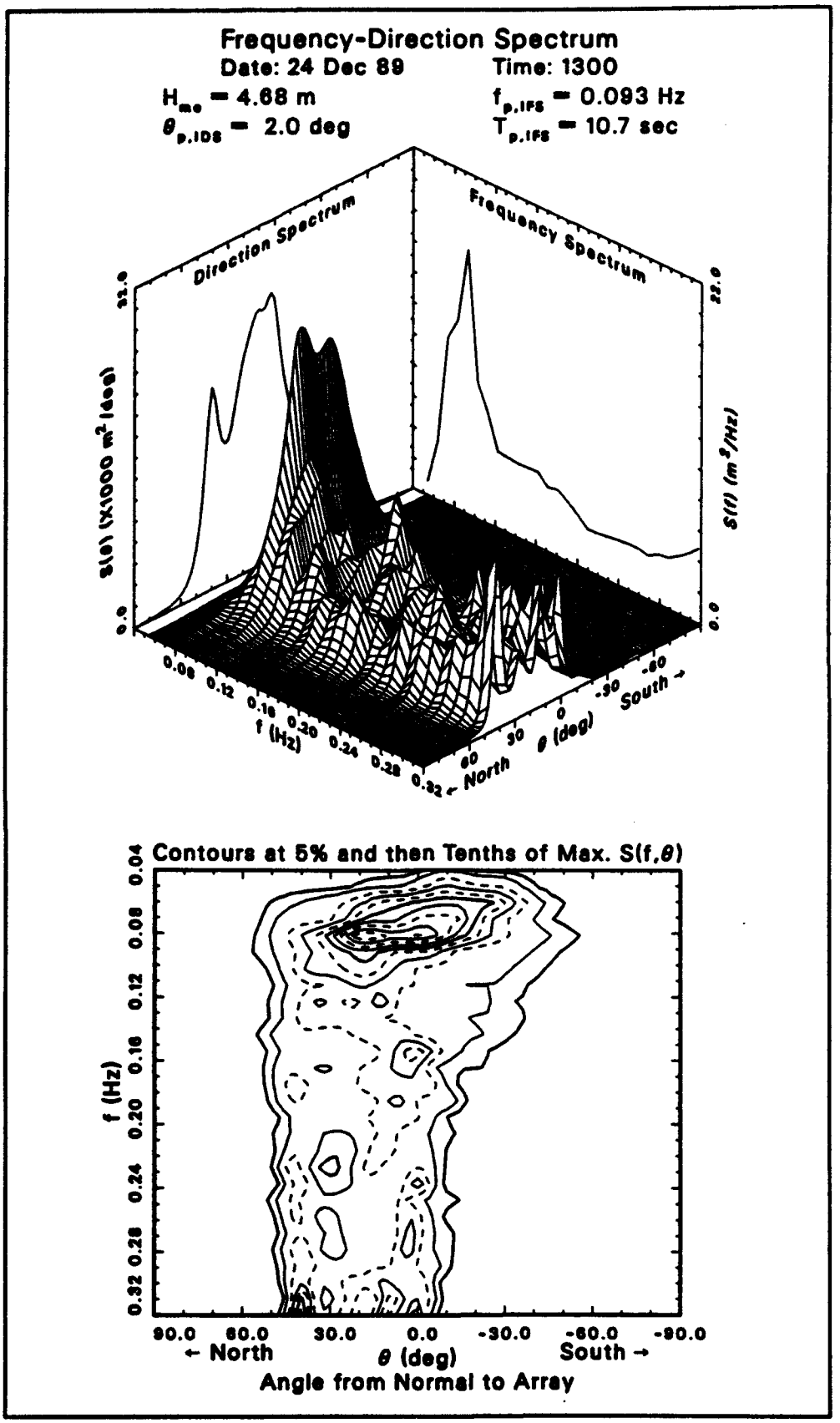

Figure 4. Sample frequency-direction spectrum

Peak frequency

Peak frequency, which has the generic notation f_p, can be defined in at least two ways. One way is to find the frequency (and direction) at which the frequency-direction spectrum is maximum. This peak frequency is denoted $f_{p,FD}$. Another way is to find the frequency at which the integrated frequency spectrum is maximum. This is the more conventional definition, because of the plethora of measured frequency spectra, and it is denoted $f_{p,IFS}$. The two peak frequencies may not be the same. If the directional distribution is broad at the frequency for which the integrated frequency spectrum is maximum, it is possible that another frequency, at which the frequency-direction spectrum has a narrow directional distribution, will denote the maximum of the frequency-direction spectrum.

Peak period

Peak period is the characteristic wave period associated with spectral peak frequency. Denoted generically by T_p, it is related to peak frequency by $T_p = 1/f_p$. Peak period from the frequency-direction spectrum is given by $T_{p,FD} = 1/f_{p,FD}$. Conventional peak period, derived from the integrated frequency spectrum, is given by $T_{p,IFS} = 1/f_{p,IFS}$.

Peak direction

Peak direction is the direction representing the most energy. Given the generic symbol θ_p, it, too, can be defined in several ways. One peak direction can be defined from the maximum of the frequency-direction spectrum. It is denoted by $\theta_{p,FD}$. Another peak direction can be associated with the maximum of the integrated direction spectrum, defined previously. This peak direction is denoted $\theta_{p,IFS}$. It can differ from $\theta_{p,FD}$ if energy in the frequency-direction spectrum is centered at different directions for different frequencies. This condition tends to smear energy along the direction axis in the integrated direction spectrum, thereby shifting the peak relative to the peak of the frequency-direction spectrum. A third measure of peak direction is a weighted average peak direction defined by

$$\theta_{p,SW} = \frac{1}{\left(\frac{1}{4}H_{mo}\right)^2} \sum_{n=1}^{N} S(f_n)\, \theta_{p,n} \qquad (7)$$

where

$\theta_{p,n}$ = peak direction of the directional distribution at the n^{th} frequency of the frequency-direction spectrum

$S(f_n)$ = integrated frequency spectrum from Equation 2

and H_{mo} is defined by Equation 4. This definition gives higher weights to the more energetic peak directions but does not rely on the single distribution with the most energy.

Directional spread

A fourth type of characteristic parameter is directional spread. This parameter, denoted generically as $\Delta\theta$, gives a measure of the range of directions from which some significant fraction of energy is propagating. The basic definition used here is the arc subtended by the middle two quartiles of a directional distribution. As illustrated in Figure 5, the directional distribution function $D(f_n,\theta_m)$ for a particular frequency f_n can be integrated from one bounding direction (here the shore-parallel direction at +90 deg) to some arbitrary direction θ_j to make a kind of cumulative distribution function $I(f_n,\theta_j)$. The formal definition is

$$I(f_n,\theta_j) = \sum_{m=1}^{j} D(f_n,\theta_m)\, d\theta \tag{8}$$

where j is the index of a discrete angle bin. The three quartile directions, called $\theta_{25\%,n}$, $\theta_{50\%,n}$, and $\theta_{75\%,n}$, respectively, satisfy the equations

$$I(f_n,\theta_{25\%,n}) = 0.25 \tag{9}$$

$$I(f_n,\theta_{50\%,n}) = 0.50 \tag{10}$$

$$I(f_n,\theta_{75\%,n}) = 0.75 \tag{11}$$

A directional spread parameter for the n^{th} frequency is defined by

$$\Delta\theta_n = \theta_{25\%,n} - \theta_{75\%,n} \tag{12}$$

If Equation 12 is applied at the frequency where the frequency-direction spectrum is maximum, a measure of directional spread at the peak of the frequency-direction spectrum is obtained. This parameter is denoted $\Delta\theta_{FDP}$. If, instead of a directional distribution function at a single frequency, the normalized integrated direction spectrum is used in the set of Equations 8 to 12, a measure of bulk directional spread is obtained. This parameter is given the symbol $\Delta\theta_{IDS}$. A third measure of directional spread is found from a spectrally weighted average of the spreads at each frequency. Denoted as $\Delta\theta_{SW}$, this parameter is found from

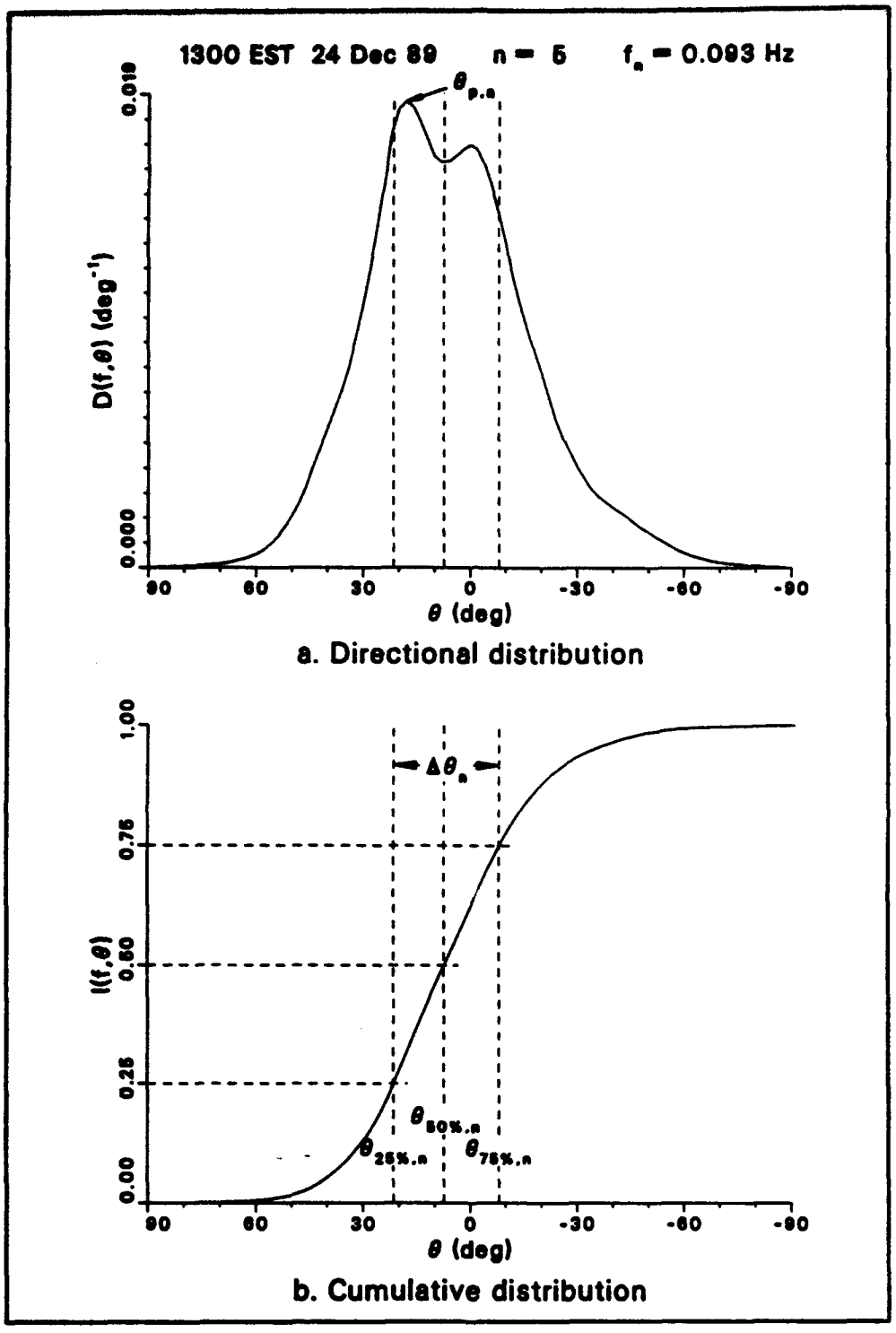

Figure 5. Directional spread computation

$$\Delta\theta_{sw} = \frac{1}{\left(\frac{1}{4}H_{mo}\right)^2} \sum_{n=1}^{N} S(f_n)\ \Delta\theta_n \qquad (13)$$

Equation 13 is like Equation 7 for the spectrally weighted peak direction.

Together, these 11 parameters give a bulk characterization of some properties of a frequency-direction spectrum. There are, of course, many other parameters that can be defined, but the present set is simple and is easier to use than the 2,548 discrete spectral densities (28 frequencies × 91 directions) required for a full description of any given spectrum discussed here.

6 Archived Results

An optical disk containing the set of observed frequency-direction spectra from all years of collection, including this fourth year, has been created to archive the observations. Appendix A contains a listing of the date, starting time, and the characterizing parameters defined previously for each case archived for the present year. It is intended to be used as a kind of index or catalog of the set of available cases. For reasons explained below, dates in Appendix A are given in the form *yymmdd* where *yy* is a two-digit year indicator (e.g., 89 means 1989), *mm* is the numeric index of the calendar month (i.e, 01 is January, 12 is December, etc.), and *dd* is day of the month. All times are Eastern Standard Time. A 24-hr clock is used.

Graphic representations of data collection times, some bulk parameters, and some auxiliary environmental variables are contained in Appendix B. One graph is shown for each month of the collection year. The upper part of each graph has time series plots of the bulk parameters H_{mo}, $T_{p,IFS}$, $\theta_{p,IDS}$, and $\Delta\theta_{IDS}$. The lower part of each graph has stick figure plots of three environmental variables. First is a kind of crude wave vector in which the stick vector has a length proportional to H_{mo} and a direction given by $\theta_{p,IDS}$ + 180 deg. The 180 deg is added to provide a physical frame of reference consistent with a vector pointing in the direction of energy propagation. The assumption that all waves propagate onshore means that all stick vectors in this part of the graph will have a component directed upward on the page.

The second stick figure plot is the wind vector as measured with the FRF environmental anemometer. Mounted at the seaward end of the FRF pier (Figure 2) at an elevation of 19.5 m above mean sea level, this instrument gives a reasonable estimate of the wind climate in the vicinity of the linear array.

The third stick figure plot is the current vector as measured with a current meter located on the line of the linear array, about 5 m northward of gauge 1 (Figure 2). Note that this current meter is in a different location from the one used in the three previous directional spectral index reports (Long 1991a, 1991b; Long and Smith 1993). This instrument was approximately 2.4 m off the bottom in water about 8 m deep and, therefore, sensed currents near the bottom. All available current data are plotted. The current meter was subject to storm damage, biological fouling, and duration-related electronic problems,

so that data are not available for some of the months covered by this report. Of the existing data, the reader may note a significant anticorrelation between cross-shore winds and cross-shore currents. This is consistent with the behavior of wall-bounded, shallow-water, wind-generated currents. Additional details about the anemometer and current meter are given by Birkemeier et al. (1985).

7 Retrieving Processed Data

The electro-optical medium containing the directional-spectral data archive is compact, but not very transportable. Consequently, a conversion program has been written to transform the data into a rather conventional, 80-column, formatted form that is much more easily distributed on common magnetic media. A user requesting some or all of the data will, by default, receive the data in formatted form. It may be possible to transfer the data in other ways, and specific requests can be coordinated with the FRF.

The data archive for the period covered by this report contains 1,505 files, one for each observed frequency-direction spectrum. When converted to formatted form, each file has a length of about 30,000 bytes, so the complete archive for the fourth collection year contains roughly 45.2 megabytes of information. A user may wish to consider whether this quantity of information will take too much system space before trying to copy the whole archive. Subsets of data can be created by reading the data archive one file at a time. Each formatted file has the generic name *FFyymmddhhmm.DAT*, where *FF* stands for formatted frequency-direction spectrum, the character grouping *yymmdd* represents the data collection date (as listed in Appendix A), and the character grouping *hhmm* represents the data collection start time (also from Appendix A).

Once a file is on equipment and in a position to be read, it can be input to a computer program through any ASCII-formatted read statement. Appendix C contains a listing of a FORTRAN program that can read the formatted data files. The variables contained in a data file are listed in the header of the program in Appendix C. A listing of a sample data file is given in Appendix D. The read statements in the program in Appendix C can be visually aligned with the data fields of the listing in Appendix D if the user wishes to edit or visually read a data file. Program variable names, especially those that have parallel symbols in this text, are also listed in the Notation (Appendix E). A user can obtain data by directing a request to:

Chief, Field Research Facility
1261 Duck Road
Kitty Hawk, NC 27949-4472
Phone: (919) 261-3511
Fax: (919) 261-4432

8 Summary of Results

Data from the fourth collection year of high-resolution, directional-spectral observations at the FRF have been put in a form that is easily accessible to researchers interested in nearshore processes. Directional gauge array, directional analysis algorithms, and definitions of characterizing parameters are described in the body of this report, as are the location and form of archived data. Both a listing and a graphic presentation of data collection times and characteristic parameters are given in the appendixes. The appendixes also contain a sample data file and a listing of a FORTRAN program that can be used to read a data file.

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Appendix A
Table of Collection Times and Bulk Parameters

Table A1
Collection Times and Bulk Parameters

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,JPM}$ Hz	$T_{p,PM}$ sec	$T_{p,JPM}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,JPM}$ deg	$\theta_{p,SW}$ deg	$\Delta\theta_{pc}$ deg	$\Delta\theta_{SW}$ deg	$\Delta\theta_{mv}$ deg
890901	0100	0.48	0.093	0.093	10.72	10.72	-16.0	-16.0	-1.9	42.2	22.2	26.8
890901	0700	0.60	0.093	0.093	10.72	10.72	-14.0	-14.0	1.6	44.1	22.5	22.0
890901	1300	0.50	0.083	0.093	11.96	10.72	-22.0	-20.0	-6.5	31.9	23.2	17.9
890901	1900	0.49	0.093	0.093	10.72	10.72	-16.0	-34.0	-19.3	26.3	24.6	22.9
890902	0100	0.46	0.093	0.093	10.72	10.72	-16.0	-30.0	-24.0	21.9	20.0	18.5
890902	0700	0.48	0.093	0.093	10.72	10.72	-12.0	-12.0	-15.5	23.0	20.9	21.4
890902	1300	0.44	0.113	0.093	8.87	10.72	-34.0	-34.0	-26.8	24.4	25.8	21.5
890902	1900	0.45	0.123	0.093	8.16	10.72	-38.0	-14.0	-28.2	24.8	23.3	20.4
890903	0100	0.50	0.123	0.250	8.16	4.01	-12.0	-12.0	-9.9	36.0	25.9	24.8
890903	0700	1.38	0.171	0.171	5.83	5.83	46.0	48.0	44.1	35.2	29.1	14.6
890903	1300	1.13	0.181	0.181	5.52	5.52	46.0	46.0	36.1	37.5	29.1	30.3
890903	1900	1.82	0.162	0.162	6.19	6.19	34.0	34.0	31.1	19.9	19.5	14.9
890904	0100	1.67	0.142	0.142	7.04	7.04	12.0	16.0	19.6	22.6	21.0	17.7
890904	0400	1.86	0.142	0.132	7.04	7.56	22.0	20.0	20.3	23.9	23.0	19.4
890904	0700	2.12	0.132	0.132	7.56	7.56	12.0	12.0	12.9	22.9	21.8	15.1
890904	1000	2.26	0.123	0.123	8.16	8.16	4.0	4.0	10.5	23.6	22.3	17.9
890904	1300	2.43	0.123	0.113	8.16	8.87	0.0	0.0	8.5	21.5	21.5	15.9
890904	1600	2.59	0.113	0.113	8.87	8.87	0.0	0.0	4.8	21.7	21.5	13.0
890904	1900	2.59	0.132	0.132	7.56	7.56	0.0	0.0	1.7	24.7	23.6	14.6
890904	2200	2.51	0.123	0.113	8.16	8.87	0.0	0.0	1.4	25.0	24.5	20.3
890905	0100	2.30	0.113	0.113	8.87	8.87	10.0	0.0	0.8	25.6	24.9	20.4
890905	0400	2.21	0.132	0.113	7.56	8.87	-4.0	-2.0	2.3	26.9	25.6	20.0
890905	0700	2.07	0.103	0.113	9.71	8.87	0.0	6.0	3.8	28.5	26.4	21.3
890905	1000	1.98	0.054	0.113	18.45	8.87	-22.0	-4.0	6.4	29.7	26.0	11.3
890905	1300	1.80	0.054	0.113	18.45	8.87	-22.0	-8.0	-0.3	29.5	25.3	10.6
890905	1600	1.85	0.054	0.054	18.45	18.45	-18.0	-12.0	-5.6	24.0	21.9	8.8
890905	1900	1.77	0.064	0.064	15.62	15.62	-14.0	-16.0	-2.5	27.8	25.0	11.5
890905	2200	1.80	0.064	0.064	15.62	15.62	-12.0	-10.0	-2.5	25.2	23.1	13.9
890906	0100	1.84	0.064	0.064	15.62	15.62	-14.0	-14.0	-7.0	23.8	20.6	11.5
890906	0400	1.87	0.064	0.064	15.62	15.62	-26.0	-14.0	-10.9	24.3	20.4	12.8
890906	0700	1.92	0.064	0.064	15.62	15.62	-22.0	-20.0	-12.6	24.1	20.1	9.6
890906	1000	1.90	0.064	0.064	15.62	15.62	-18.0	-18.0	-10.8	23.0	21.6	11.7

(Sheet 1 of 30)

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,JPS}$ Hz	$T_{p,PM}$ sec	$T_{p,JPS}$ sec	$\theta_{o,PM}$ deg	$\theta_{o,JPS}$ deg	$\theta_{o,DM}$ deg	$\Delta\theta_{pm}$ deg	$\Delta\theta_{pw}$ deg	$\Delta\theta_{mw}$ deg
890906	1300	1.85	0.064	0.064	15.62	15.62	-22.0	-18.0	-13.1	22.8	21.2	11.6
890906	1600	2.00	0.074	0.064	13.57	15.62	-18.0	-20.0	-10.6	27.6	21.5	13.2
890906	1900	2.11	0.064	0.064	15.62	15.62	-22.0	-20.0	-9.6	27.4	21.8	14.0
890906	2200	2.21	0.064	0.064	15.62	15.62	-18.0	-20.0	-8.6	26.8	20.1	9.2
890907	0100	2.29	0.074	0.074	13.57	13.57	-24.0	-20.0	-7.6	29.0	21.3	11.7
890907	0400	2.34	0.074	0.074	13.57	13.57	-22.0	-22.0	-12.5	24.4	20.0	9.7
890907	0700	2.46	0.064	0.074	15.62	13.57	-22.0	-22.0	-15.9	22.1	18.8	7.8
890907	1000	2.31	0.074	0.074	13.57	13.57	-20.0	-22.0	-14.6	23.9	20.1	13.9
890907	1300	2.23	0.074	0.074	13.57	13.57	-22.0	-22.0	-15.0	23.2	20.1	10.4
890907	1600	2.17	0.064	0.074	15.62	13.57	-22.0	-22.0	-15.9	22.5	20.8	10.4
890907	1900	2.09	0.064	0.074	15.62	13.57	-18.0	-20.0	-16.9	22.9	21.7	13.7
890907	2200	2.03	0.064	0.083	15.62	11.98	-22.0	-20.0	-16.3	22.5	20.6	11.9
890908	0100	2.09	0.064	0.064	15.62	15.62	-18.0	-18.0	-19.0	19.9	18.8	11.7
890908	0400	2.09	0.064	0.064	15.62	15.62	-18.0	-18.0	-18.7	19.5	19.4	11.4
890908	0700	2.12	0.054	0.054	18.45	18.45	-18.0	-18.0	-19.5	20.1	20.4	12.4
890908	1000	2.19	0.054	0.064	18.45	15.62	-22.0	-20.0	-19.2	18.8	19.0	9.9
890908	1300	2.19	0.064	0.064	15.62	15.62	-18.0	-18.0	-19.2	16.5	16.9	11.5
890908	1600	2.11	0.064	0.064	15.62	15.62	-18.0	-18.0	-16.9	16.2	16.8	12.7
890908	1900	1.95	0.064	0.064	15.62	15.62	-14.0	-16.0	-15.0	15.2	15.9	10.7
890908	2200	1.69	0.074	0.074	13.57	13.57	-18.0	-18.0	-14.5	20.5	19.5	12.7
890909	0100	1.56	0.074	0.074	13.57	13.57	-18.0	-14.0	-14.2	21.4	21.3	18.6
890909	0400	1.62	0.074	0.074	13.57	13.57	-12.0	-8.0	-10.6	19.3	19.4	15.3
890909	0700	1.94	0.074	0.074	13.57	13.57	-16.0	-14.0	-14.1	17.5	17.4	13.9
890909	1000	2.46	0.074	0.074	13.57	13.57	-12.0	-14.0	-12.8	13.4	13.8	11.4
890909	1300	2.50	0.074	0.074	13.57	13.57	-18.0	-16.0	-16.1	15.7	15.2	10.8
890909	1600	2.13	0.074	0.074	13.57	13.57	-18.0	-16.0	-14.9	18.8	18.3	19.0
890909	1900	2.15	0.074	0.074	13.57	13.57	-12.0	-12.0	-13.2	17.5	16.8	14.6
890909	2200	2.12	0.074	0.064	13.57	15.62	0.0	-4.0	-6.9	18.1	16.4	14.0
890910	0100	1.91	0.064	0.074	15.62	13.57	-8.0	-8.0	-8.9	19.5	19.6	16.3
890910	0400	1.72	0.074	0.074	13.57	13.57	-12.0	-14.0	-13.6	21.7	21.8	21.2
890910	0700	1.54	0.074	0.074	13.57	13.57	-12.0	-12.0	-12.8	20.6	20.6	17.9
890910	1000	1.37	0.103	0.074	9.71	13.57	-24.0	-10.0	-6.8	25.2	24.1	22.1
890910	1300	1.20	0.083	0.074	11.98	13.57	0.0	-6.0	-10.2	25.3	25.0	20.6
890910	1600	1.08	0.074	0.074	13.57	13.57	-12.0	-10.0	-13.3	26.5	26.1	24.1
890910	1900	1.07	0.083	0.083	11.98	11.98	2.0	0.0	-8.4	26.1	24.9	20.8
890910	2200	1.02	0.083	0.083	11.98	11.98	0.0	0.0	-8.8	27.5	27.3	25.7
890911	0100	0.96	0.083	0.083	11.98	11.98	0.0	2.0	-6.7	28.6	27.0	20.9
890911	0400	0.86	0.083	0.083	11.98	11.98	4.0	2.0	-4.3	28.8	27.5	21.3
890911	0700	0.80	0.093	0.083	10.72	11.98	4.0	2.0	-2.6	25.7	24.0	19.9
890911	1300	0.81	0.083	0.083	11.98	11.98	0.0	2.0	-3.5	25.1	22.8	17.7
890911	1900	0.69	0.093	0.093	10.72	10.72	0.0	2.0	0.1	25.9	24.3	18.3
890912	0100	0.68	0.093	0.093	10.72	10.72	-10.0	-10.0	-3.4	27.0	28.3	22.6
890912	0700	0.61	0.103	0.103	9.71	9.71	14.0	12.0	0.3	29.7	27.2	21.6
890912	1300	0.60	0.093	0.103	10.72	9.71	0.0	6.0	1.0	33.9	31.4	21.1
890912	1900	0.54	0.103	0.103	9.71	9.71	2.0	2.0	-5.7	28.6	28.4	15.8
890913	0100	0.55	0.123	0.113	8.16	8.87	2.0	2.0	-0.5	29.9	25.9	25.1
890913	0700	0.53	0.113	0.113	8.87	8.87	4.0	4.0	0.0	31.4	29.4	28.4
890913	1300	0.52	0.123	0.113	8.16	8.87	2.0	-14.0	-10.9	33.8	36.3	23.0
890913	1900	0.52	0.171	0.113	5.83	8.87	-48.0	-52.0	-24.0	49.4	36.7	12.3
890914	0100	0.67	0.162	0.162	6.19	6.19	-46.0	-44.0	-35.7	35.5	23.3	12.6
890914	0700	0.71	0.152	0.152	6.58	6.58	-46.0	-44.0	-42.3	22.1	16.8	10.8
890914	1300	0.64	0.142	0.142	7.04	7.04	-40.0	-40.0	-36.6	20.3	18.1	14.3
890914	1900	0.68	0.142	0.132	7.04	7.56	-42.0	-42.0	-39.5	18.9	15.9	10.0
890915	0100	0.59	0.132	0.142	7.56	7.04	-28.0	-40.0	-37.9	18.8	16.9	11.3
890915	1300	0.48	0.142	0.142	7.04	7.04	-40.0	-28.0	-30.4	23.8	20.4	17.8

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,avg}$ Hz	$f_{p,spec}$ Hz	$T_{p,avg}$ sec	$T_{p,spec}$ sec	$\theta_{p,avg}$ deg	$\theta_{p,spec}$ deg	$\theta_{p,mv}$ deg	$\Delta\theta_{avg}$ deg	$\Delta\theta_{spec}$ deg	$\Delta\theta_{mv}$ deg
890915	1900	0.48	0.142	0.142	7.04	7.04	-42.0	-26.0	-34.5	24.4	21.7	17.4
890916	0100	0.45	0.240	0.074	4.17	13.57	-54.0	-24.0	-30.0	27.1	17.0	7.4
890916	1300	0.56	0.132	0.132	7.56	7.56	-40.0	-38.0	-30.0	30.7	33.3	18.5
890917	0100	0.62	0.123	0.132	8.16	7.56	-36.0	24.0	-8.0	45.6	36.3	40.5
890918	0100	0.62	0.083	0.083	11.98	11.98	-18.0	-16.0	-21.6	23.7	25.5	19.1
890918	1000	0.75	0.074	0.074	13.57	13.57	-32.0	-28.0	-13.8	46.6	24.5	14.4
890918	1300	1.09	0.074	0.210	13.57	4.75	-20.0	10.0	3.0	41.2	22.6	14.4
890918	1600	1.52	0.191	0.181	5.24	5.52	14.0	-2.0	7.8	30.4	25.7	20.9
890918	1900	1.95	0.162	0.162	6.19	6.19	8.0	8.0	10.8	26.5	21.3	15.5
890918	2200	1.79	0.152	0.152	6.58	6.58	12.0	20.0	9.8	30.4	22.6	18.3
890919	0100	1.66	0.152	0.152	6.58	6.58	24.0	26.0	13.8	44.1	24.1	19.6
890919	0700	2.13	0.113	0.123	8.87	8.16	-30.0	-30.0	2.6	56.2	42.7	13.9
890919	1000	1.94	0.113	0.123	8.87	8.16	-38.0	-26.0	-18.1	45.3	44.1	17.6
890919	1300	1.78	0.113	0.113	8.87	8.87	-28.0	-28.0	-13.8	38.4	37.8	20.9
890919	1600	1.72	0.113	0.123	8.87	8.16	-36.0	-26.0	-21.8	37.5	36.6	28.7
890919	1900	1.80	0.113	0.123	8.87	8.16	-28.0	-26.0	-30.2	29.5	33.5	19.7
890919	2200	1.88	0.113	0.113	8.87	8.87	-34.0	-26.0	-28.4	23.4	28.9	16.6
890920	0100	1.66	0.113	0.113	8.87	8.87	-30.0	-32.0	-33.1	22.7	27.7	14.2
890920	0400	1.59	0.103	0.113	9.71	8.87	-36.0	-36.0	-30.2	24.9	28.6	17.2
890920	0700	1.47	0.123	0.113	8.16	8.87	-40.0	-30.0	-37.2	26.2	29.9	24.2
890920	1000	1.40	0.113	0.113	8.87	8.87	-26.0	-26.0	-35.2	24.8	28.2	15.3
890920	1300	1.27	0.113	0.113	8.87	8.87	-36.0	-34.0	-32.7	21.5	25.5	15.8
890920	1600	1.21	0.093	0.113	10.72	8.87	-30.0	-28.0	-28.3	22.4	24.8	16.1
890920	1900	1.32	0.103	0.113	9.71	8.87	-26.0	-28.0	-31.1	18.7	21.1	11.7
890920	2200	1.32	0.064	0.123	15.62	8.16	-30.0	-30.0	-33.4	17.7	20.4	6.1
890921	0100	1.29	0.064	0.074	15.62	13.57	-32.0	-32.0	-33.0	18.2	20.8	5.7
890921	0400	1.32	0.064	0.064	15.62	15.62	-32.0	-32.0	-34.2	19.0	20.8	8.6
890921	0700	1.73	0.064	0.064	15.62	15.62	-32.0	-32.0	-30.8	11.2	14.0	5.9
890921	1000	2.43	0.064	0.064	15.62	15.62	-30.0	-32.0	-30.3	9.4	11.1	6.0
890921	1300	2.53	0.064	0.064	15.62	15.62	-32.0	-32.0	-30.7	10.6	11.6	7.6
890921	1600	2.29	0.064	0.064	15.62	15.62	-28.0	-30.0	-30.2	11.1	12.6	9.2
890921	1900	2.26	0.074	0.074	13.57	13.57	-30.0	-30.0	-29.0	10.7	12.1	6.7
890921	2200	2.35	0.074	0.074	13.57	13.57	-32.0	-32.0	-30.9	9.5	11.6	5.7
890922	0100	2.27	0.074	0.074	13.57	13.57	-28.0	-32.0	-32.9	13.2	15.1	8.9
890922	0400	2.15	0.074	0.074	13.57	13.57	-32.0	-32.0	-32.7	13.4	15.1	9.2
890922	0700	1.94	0.083	0.083	11.98	11.98	-26.0	-32.0	-34.7	15.7	17.8	10.2
890922	1000	1.94	0.093	0.083	10.72	11.98	-32.0	-34.0	-37.1	17.7	18.7	9.4
890922	1300	1.73	0.083	0.083	11.98	11.98	-34.0	-32.0	-36.4	16.5	16.6	10.9
890922	1600	1.57	0.083	0.083	11.98	11.98	-26.0	-30.0	-35.2	15.4	14.6	9.1
890922	1900	1.44	0.093	0.093	10.72	10.72	-30.0	-30.0	-33.7	15.8	15.8	11.8
890922	2200	1.43	0.093	0.093	10.72	10.72	-30.0	-30.0	-33.4	15.2	15.8	7.3
890923	0100	1.31	0.093	0.093	10.72	10.72	-32.0	-32.0	-35.0	16.7	17.0	11.9
890923	0400	1.23	0.093	0.093	10.72	10.72	-30.0	-30.0	-32.0	15.4	15.6	9.7
890923	0700	1.16	0.103	0.093	9.71	10.72	-28.0	-30.0	-31.0	15.8	15.6	10.9
890923	1000	1.16	0.123	0.103	8.16	9.71	-30.0	-32.0	-28.8	14.3	14.4	9.2
890923	1300	1.10	0.103	0.103	9.71	9.71	-30.0	-30.0	-31.7	14.2	14.6	9.3
890923	1600	0.96	0.103	0.103	9.71	9.71	-28.0	-28.0	-33.4	15.7	15.5	11.3
890923	1900	1.32	0.201	0.201	4.98	4.98	56.0	56.0	28.3	73.4	14.0	7.1
890923	2200	2.52	0.142	0.142	7.04	7.04	30.0	30.0	34.6	19.0	17.1	11.3
890924	0100	2.68	0.132	0.132	7.56	7.56	24.0	24.0	29.8	19.9	17.4	12.3
890924	0400	2.48	0.132	0.132	7.56	7.56	22.0	22.0	26.3	22.3	19.3	12.0
890924	0700	2.17	0.142	0.152	7.04	6.58	24.0	26.0	24.8	24.7	20.8	13.4
890924	1000	1.81	0.113	0.152	8.87	6.58	10.0	24.0	24.3	28.1	24.1	20.3
890924	1300	1.59	0.123	0.171	8.16	5.83	12.0	14.0	29.0	28.9	25.8	19.7
890924	1600	1.37	0.123	0.171	8.16	5.83	10.0	26.0	30.1	30.7	23.4	22.1

(Sheet 3 of 30)

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PD}$ Hz	$f_{p,SPS}$ Hz	$T_{p,PD}$ sec	$T_{p,SPS}$ sec	$\theta_{p,PD}$ deg	$\theta_{p,SPS}$ deg	$\theta_{p,SW}$ deg	$\Delta\theta_{SPS}$ deg	$\Delta\theta_{SW}$ deg	$\Delta\theta_{NSW}$ deg
890924	1900	1.32	0.123	0.123	8.16	8.16	6.0	26.0	25.2	29.3	23.0	21.6
890924	2200	1.32	0.142	0.132	7.04	7.56	12.0	12.0	13.9	29.9	26.0	22.3
890925	0100	1.29	0.152	0.152	6.58	6.58	20.0	20.0	10.7	46.1	30.1	32.4
890925	0400	1.33	0.113	0.162	8.87	6.19	-24.0	-24.0	10.4	48.3	32.8	16.3
890925	0700	1.31	0.103	0.201	9.71	4.98	-22.0	-22.0	11.3	45.9	34.9	11.6
890925	1000	1.44	0.103	0.181	9.71	5.52	-16.0	-20.0	-4.6	39.3	33.0	15.5
890925	1300	1.50	0.152	0.162	6.58	6.19	-14.0	-14.0	-5.3	30.4	26.7	18.3
890925	1600	1.49	0.142	0.142	7.04	7.04	-12.0	-14.0	-5.7	33.3	31.1	27.2
890925	1900	1.60	0.113	0.123	8.87	8.16	-22.0	-22.0	-19.8	28.1	29.3	15.4
890925	2200	1.47	0.123	0.123	8.16	8.16	-22.0	-22.0	-17.1	23.6	24.0	11.5
890926	0100	1.29	0.113	0.123	8.87	8.16	-20.0	-20.0	-20.9	23.9	27.0	13.5
890926	0400	1.15	0.113	0.113	8.87	8.87	-18.0	-18.0	-32.6	30.1	32.1	12.3
890926	0700	1.04	0.113	0.113	8.87	8.87	-20.0	-12.0	-33.0	30.5	31.4	15.2
890926	1300	0.95	0.132	0.123	7.56	8.16	-20.0	-18.0	-16.4	23.0	26.1	13.3
890926	1900	0.91	0.132	0.132	7.56	7.56	-12.0	-12.0	1.6	52.4	24.7	22.5
890927	0100	1.65	0.181	0.181	5.52	5.52	30.0	32.0	29.0	20.9	16.5	13.6
890927	0400	2.07	0.162	0.162	6.19	6.19	34.0	34.0	33.0	20.7	19.0	14.0
890927	0700	2.42	0.132	0.142	7.56	7.04	16.0	28.0	26.3	22.6	20.4	15.5
890927	1000	2.23	0.123	0.132	8.16	7.56	6.0	20.0	22.8	21.8	19.9	14.8
890927	1300	1.99	0.132	0.123	7.56	8.16	6.0	6.0	17.2	22.5	21.4	17.3
890927	1900	1.46	0.123	0.123	8.16	8.16	22.0	22.0	23.2	24.3	23.1	20.2
890928	0100	1.26	0.113	0.123	8.87	8.16	-16.0	22.0	15.0	32.5	27.1	23.8
890928	0700	1.17	0.132	0.132	7.56	7.56	8.0	8.0	13.7	35.6	33.6	35.4
890928	1300	1.01	0.142	0.142	7.04	7.04	4.0	10.0	6.8	31.4	30.3	24.5
890928	1900	0.85	0.103	0.123	9.71	8.16	-10.0	-14.0	-8.4	41.1	40.8	18.5
890929	0100	0.81	0.142	0.142	7.04	7.04	-20.0	-20.0	-15.9	31.8	33.3	23.9
890929	0700	0.77	0.142	0.132	7.04	7.56	-18.0	-4.0	-13.0	33.5	33.7	31.9
890929	1300	0.68	0.132	0.132	7.56	7.56	-24.0	-24.0	-28.3	26.9	27.1	20.2
890929	1900	0.66	0.132	0.132	7.56	7.56	-12.0	-22.0	-25.3	24.0	23.2	21.4
890930	0100	0.60	0.132	0.132	7.56	7.56	-10.0	-24.0	-20.1	19.7	20.3	18.4
890930	0700	0.55	0.132	0.132	7.56	7.56	-26.0	-24.0	-30.5	25.5	24.7	22.0
890930	1300	0.49	0.123	0.142	8.16	7.04	-28.0	-28.0	-29.0	24.1	23.5	17.9
890930	1900	0.56	0.123	0.123	8.16	8.16	-30.0	-16.0	-14.7	26.5	28.5	20.6
891001	0100	0.56	0.093	0.093	10.72	10.72	-12.0	-12.0	2.4	28.3	26.4	16.4
891001	0700	0.63	0.191	0.093	5.24	10.72	38.0	38.0	0.1	55.2	25.5	16.4
891001	1300	0.65	0.152	0.103	6.58	9.71	30.0	30.0	5.6	53.6	34.2	57.5
891001	1900	0.90	0.162	0.162	6.19	6.19	8.0	8.0	-6.1	41.0	36.6	18.9
891002	0100	0.89	0.113	0.103	8.87	9.71	10.0	10.0	-16.1	46.7	40.8	24.9
891002	0700	0.97	0.171	0.171	5.83	5.83	-46.0	-48.0	-26.5	44.6	31.1	37.7
891002	1300	0.91	0.132	0.152	7.56	6.58	2.0	-16.0	-25.1	30.3	31.8	22.1
891002	1900	1.01	0.132	0.132	7.56	7.56	-40.0	-42.0	-34.7	37.6	32.0	37.2
891003	0100	0.90	0.123	0.123	8.16	8.16	-20.0	-12.0	-27.3	28.9	29.6	24.0
891003	0700	0.92	0.132	0.132	7.56	7.56	-24.0	-12.0	-21.4	21.0	23.4	18.3
891003	1300	0.80	0.123	0.123	8.16	8.16	-24.0	-24.0	-14.8	24.8	22.1	19.2
891003	1900	0.71	0.123	0.123	8.16	8.16	-14.0	-14.0	-16.1	18.9	19.9	13.8
891004	0100	1.39	0.181	0.191	5.52	5.24	36.0	40.0	32.2	21.9	15.9	10.7
891004	0700	1.61	0.152	0.152	6.58	6.58	22.0	22.0	28.0	23.1	19.7	13.0
891004	1300	1.09	0.132	0.123	7.56	8.16	22.0	30.0	26.1	28.9	20.0	18.7
891004	1900	0.99	0.132	0.132	7.56	7.56	18.0	28.0	26.6	30.5	19.2	22.7
891005	0100	0.71	0.152	0.152	6.58	6.58	24.0	24.0	21.3	22.1	17.2	12.4
891005	0700	0.98	0.171	0.162	5.83	6.19	42.0	40.0	34.1	19.1	15.3	11.4
891005	1300	0.68	0.162	0.162	6.19	6.19	32.0	32.0	30.5	27.1	21.1	10.9
891005	1900	0.41	0.142	0.162	7.04	6.19	6.0	20.0	10.2	38.1	25.9	26.6

Table A1 (Continued)

Date	Time EST	H_{m_o} m	$f_{p,PM}$ Hz	$f_{p,JPO}$ Hz	$T_{p,PM}$ sec	$T_{p,JPO}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,JPO}$ deg	$\theta_{p,MEM}$ deg	$\Delta\theta_{PM}$ deg	$\Delta\theta_{JPO}$ deg	$\Delta\theta_{MEM}$ deg
891006	0100	0.29	0.113	0.113	8.87	8.87	-16.0	-16.0	-12.8	30.2	25.3	15.6
891006	0700	0.23	0.113	0.074	8.87	13.57	-30.0	-24.0	-22.9	23.4	22.3	18.5
891006	1300	0.22	0.074	0.074	13.57	13.57	-20.0	-16.0	-24.3	24.3	24.8	19.6
891006	1900	0.22	0.074	0.074	13.57	13.57	-16.0	-14.0	-25.7	31.8	24.5	23.8
891007	0100	0.21	0.074	0.074	13.57	13.57	-16.0	-14.0	-26.3	34.2	27.8	18.3
891007	0700	0.26	0.250	0.250	4.01	4.01	60.0	-12.0	-1.0	73.8	31.2	18.2
891007	1300	0.86	0.181	0.181	5.52	5.52	46.0	46.0	46.5	18.0	16.5	10.9
891007	1900	0.71	0.181	0.181	5.52	5.52	46.0	46.0	36.5	28.7	23.4	22.7
891008	0100	0.68	0.191	0.191	5.24	5.24	40.0	40.0	43.0	24.7	18.7	13.7
891008	0700	0.76	0.181	0.181	5.52	5.52	32.0	34.0	35.1	17.8	16.1	10.3
891008	1300	0.54	0.191	0.191	5.24	5.24	34.0	34.0	33.3	25.5	17.9	14.3
891008	1900	0.75	0.210	0.220	4.75	4.54	34.0	34.0	30.5	23.6	18.1	15.7
891009	0100	0.83	0.201	0.201	4.98	4.98	30.0	34.0	37.0	22.6	18.3	16.8
891009	0700	0.87	0.171	0.181	5.83	5.52	28.0	28.0	32.9	18.1	12.8	7.5
891009	1300	0.93	0.162	0.171	6.19	5.83	24.0	26.0	29.2	18.1	16.4	10.2
891009	1900	0.78	0.162	0.152	6.19	6.58	30.0	28.0	26.7	20.3	17.4	13.7
891010	0100	0.61	0.162	0.162	6.19	6.19	28.0	30.0	25.0	22.2	17.9	10.6
891010	0700	0.41	0.152	0.152	6.58	6.58	10.0	12.0	13.7	32.8	21.0	15.6
891010	1300	0.49	0.162	0.162	6.19	6.19	12.0	14.0	3.7	30.2	26.0	16.7
891010	1900	0.71	0.201	0.201	4.98	4.98	-18.0	-18.0	-7.6	33.6	31.8	27.1
891011	0100	0.61	0.132	0.123	7.56	8.16	-2.0	-2.0	-0.9	31.0	32.0	20.1
891011	0700	0.59	0.171	0.171	5.83	5.83	-4.0	-6.0	-4.5	30.3	28.4	31.9
891011	1300	0.58	0.162	0.162	6.19	6.19	-6.0	-6.0	-10.3	29.9	30.7	26.4
891011	1900	0.46	0.132	0.093	7.56	10.72	-42.0	-18.0	-15.0	35.7	33.6	42.7
891012	0100	0.53	0.142	0.132	7.04	7.56	-44.0	-42.0	-28.1	40.5	27.7	18.8
891012	0700	0.59	0.152	0.142	6.58	7.04	-44.0	-44.0	-31.7	34.8	23.3	12.6
891012	1300	0.54	0.162	0.152	6.19	6.58	-38.0	-36.0	-25.0	30.5	26.4	19.5
891012	1900	0.51	0.083	0.093	11.98	10.72	-6.0	-8.0	-20.7	35.4	28.4	28.0
891013	0100	0.55	0.103	0.103	9.71	9.71	-14.0	-22.0	-22.8	32.5	29.4	30.2
891013	1900	0.43	0.103	0.132	9.71	7.56	-12.0	-14.0	-27.4	27.6	22.8	16.3
891014	0100	0.41	0.132	0.132	7.56	7.56	-36.0	-26.0	-32.3	25.9	22.1	21.6
891014	0700	0.40	0.132	0.132	7.56	7.56	-40.0	-28.0	-32.6	28.4	23.9	27.3
891014	1300	0.40	0.142	0.093	7.04	10.72	-30.0	-34.0	-26.7	30.7	24.5	15.7
891014	1900	0.45	0.142	0.093	7.04	10.72	-40.0	-40.0	-24.6	33.0	21.7	9.5
891015	0100	0.45	0.103	0.103	9.71	9.71	-8.0	-38.0	-21.1	31.5	24.1	24.3
891016	0700	0.37	0.142	0.113	7.04	8.87	-42.0	-38.0	-34.6	29.0	26.2	20.8
891016	1000	0.33	0.132	0.113	7.56	8.87	-36.0	-36.0	-34.7	30.6	27.9	20.4
891016	1900	0.34	0.142	0.113	7.04	8.87	-40.0	-38.0	-32.6	27.0	22.3	16.8
891017	1000	0.41	0.054	0.054	18.45	18.45	-4.0	-40.0	-33.5	28.4	19.2	22.5
891017	1300	0.45	0.142	0.054	7.04	18.45	-38.0	-28.0	-32.6	23.4	17.5	12.5
891017	1900	0.48	0.054	0.054	18.45	18.45	-4.0	-42.0	-32.1	32.1	19.0	18.4
891018	0700	0.57	0.064	0.064	15.62	15.62	-8.0	-48.0	-31.4	37.3	14.9	13.9
891018	1300	0.55	0.171	0.064	5.83	15.62	-46.0	-46.0	-34.5	34.1	17.0	19.8
891018	1900	0.85	0.210	0.210	4.75	4.75	56.0	56.0	32.2	67.8	21.0	9.0
891019	0100	1.32	0.142	0.142	7.04	7.04	26.0	26.0	31.0	18.5	16.4	10.8
891019	0700	1.38	0.123	0.123	8.16	8.16	22.0	22.0	18.9	28.0	30.9	18.5
891020	0700	1.05	0.093	0.103	10.72	9.71	6.0	8.0	-14.2	38.3	35.8	18.3
891020	1300	0.98	0.132	0.103	7.56	9.71	-46.0	-46.0	-15.7	48.2	30.9	23.3
891020	1900	0.87	0.103	0.103	9.71	9.71	10.0	6.0	-8.8	37.1	30.7	23.1

Table A1 (Continued)

Date	Time EST	H_{m_0} m	$f_{p,PM}$ Hz	$f_{p,JPO}$ Hz	$T_{p,PM}$ sec	$T_{p,JPO}$ sec	$\theta_{m,PM}$ deg	$\theta_{m,JPO}$ deg	$\theta_{m,DW}$ deg	$\Delta\theta_{m,PM}$ deg	$\Delta\theta_{m,DW}$ deg	$\Delta\theta_{m,JPO}$ deg
891021	0100	0.63	0.093	0.093	10.72	10.72	6.0	8.0	-6.4	34.3	31.1	26.1
891021	0700	0.53	0.093	0.093	10.72	10.72	-12.0	-14.0	-6.2	29.1	28.3	23.2
891021	1300	0.43	0.093	0.103	10.72	9.71	-4.0	-2.0	-14.1	30.3	27.3	22.2
891021	1900	0.40	0.103	0.103	9.71	9.71	-20.0	-46.0	-25.0	32.1	16.0	20.6
891022	0100	0.31	0.093	0.093	10.72	10.72	-12.0	-12.0	-23.9	27.6	20.0	21.0
891022	0700	0.35	0.103	0.103	9.71	9.71	-20.0	-18.0	-4.3	34.6	25.4	25.5
891022	1300	0.67	0.240	0.220	4.17	4.54	54.0	54.0	32.7	49.4	18.7	14.2
891022	1900	0.82	0.162	0.162	6.19	6.19	30.0	30.0	27.6	24.9	18.4	12.6
891023	0100	0.60	0.201	0.103	4.98	9.71	40.0	38.0	16.6	48.0	21.0	11.2
891023	0700	0.90	0.220	0.220	4.54	4.54	52.0	52.0	32.3	33.7	24.1	21.4
891023	1900	0.74	0.181	0.113	5.52	8.87	34.0	38.0	6.8	52.1	26.1	13.3
891024	0100	0.78	0.113	0.113	8.87	8.87	-20.0	-14.0	-2.6	34.5	30.4	26.2
891024	0700	1.04	0.210	0.220	4.75	4.54	22.0	20.0	9.0	34.4	23.3	15.7
891024	1300	1.32	0.132	0.201	7.56	4.98	-26.0	-24.0	5.0	42.3	24.2	19.2
891024	1900	1.68	0.123	0.123	8.16	8.16	-18.0	-10.0	6.0	37.0	22.1	14.3
891025	0100	1.83	0.123	0.113	8.16	8.87	-18.0	-4.0	2.7	30.0	22.4	16.9
891025	0400	1.95	0.103	0.103	9.71	9.71	-12.0	-8.0	4.0	33.1	22.1	15.2
891025	0700	2.17	0.103	0.103	9.71	9.71	-18.0	-20.0	-4.3	28.5	20.8	11.2
891025	1300	2.46	0.093	0.093	10.72	10.72	-18.0	-16.0	-12.6	20.3	19.6	10.3
891025	1600	2.63	0.083	0.085	11.98	11.98	-16.0	-16.0	-12.7	16.9	17.4	13.3
891025	1900	2.53	0.074	0.083	13.57	11.98	-12.0	-12.0	-11.7	16.6	17.3	11.4
891025	2200	2.46	0.083	0.083	11.98	11.98	-16.0	-14.0	-13.9	18.3	18.6	16.3
891026	0100	2.39	0.083	0.083	11.98	11.98	-14.0	-14.0	-14.2	20.4	20.6	16.6
891026	0400	2.48	0.083	0.083	11.98	11.98	-8.0	-12.0	-10.1	17.6	17.7	16.0
891026	0700	2.44	0.083	0.083	11.98	11.98	-14.0	-14.0	-12.0	16.9	17.3	16.3
891026	1300	2.27	0.074	0.074	13.57	13.57	-2.0	-10.0	-8.4	18.5	18.7	14.7
891026	1600	2.18	0.074	0.074	13.57	13.57	-6.0	-6.0	-7.8	19.3	19.6	13.9
891026	1900	1.98	0.074	0.074	13.57	13.57	-12.0	-6.0	-11.9	20.5	21.1	16.9
891026	2200	1.90	0.074	0.074	13.57	13.57	-10.0	-10.0	-12.0	21.2	20.9	18.3
891027	0100	1.92	0.074	0.074	13.57	13.57	-4.0	-12.0	-10.1	20.8	21.0	21.8
891027	0400	1.94	0.074	0.074	13.57	13.57	-16.0	-10.0	-12.0	21.4	21.8	19.7
891027	0700	1.87	0.074	0.074	13.57	13.57	-12.0	-12.0	-12.0	20.0	20.3	16.1
891027	1000	1.73	0.074	0.074	13.57	13.57	-14.0	-14.0	-13.0	21.1	22.0	19.8
891027	1300	1.70	0.074	0.074	13.57	13.57	-4.0	-12.0	-9.3	21.7	21.8	18.6
891027	1900	1.60	0.074	0.074	13.57	13.57	-12.0	-14.0	-9.9	24.5	24.5	21.8
891028	0100	1.59	0.074	0.074	13.57	13.57	-12.0	-12.0	-12.9	23.4	23.4	21.6
891028	0700	1.58	0.074	0.074	13.57	13.57	-12.0	-12.0	-12.3	22.1	22.3	20.6
891028	1300	1.58	0.074	0.083	13.57	11.98	-12.0	-14.0	-13.1	21.6	21.4	18.8
891028	1900	1.49	0.083	0.074	11.98	13.57	-14.0	-14.0	-14.8	24.3	24.7	21.2
891029	0100	1.41	0.074	0.074	13.57	13.57	-16.0	-16.0	-13.6	22.6	23.6	19.3
891029	0700	1.34	0.074	0.074	13.57	13.57	-10.0	-14.0	-15.0	23.6	25.3	18.7
891029	1300	1.34	0.074	0.074	13.57	13.57	-18.0	-16.0	-20.1	29.5	25.2	18.5
891029	1900	1.45	0.123	0.074	8.16	13.57	-26.0	-28.0	-24.7	30.5	23.9	16.1
891030	0100	1.46	0.113	0.113	8.87	8.87	-36.0	-36.0	-26.2	28.2	23.6	14.0
891030	0700	1.56	0.113	0.113	8.87	8.87	-36.0	-28.0	-27.5	28.9	22.5	17.2
891030	1300	1.61	0.103	0.113	9.71	8.87	-32.0	-32.0	-26.9	25.1	21.1	20.7
891030	1900	1.45	0.113	0.113	8.87	8.87	-38.0	-38.0	-28.7	29.3	24.8	18.7
891031	0100	1.86	0.103	0.113	9.71	8.87	-30.0	-28.0	-29.6	22.8	21.3	15.2
891031	0400	1.91	0.113	0.103	8.87	9.71	-32.0	-30.0	-23.6	22.1	22.0	17.5
891031	0700	1.98	0.103	0.103	9.71	9.71	-34.0	-20.0	-30.9	23.4	23.0	18.6
891031	1000	1.89	0.103	0.103	9.71	9.71	-38.0	-36.0	-31.7	29.6	28.7	28.1
891031	1300	1.71	0.103	0.103	9.71	9.71	-40.0	-38.0	-29.0	32.2	29.9	33.5
891031	1900	1.40	0.113	0.113	8.87	8.87	-40.0	-16.0	-31.3	32.5	29.2	24.7

Table A1 (Continued)

Date	Time EST	H_{m_0} m	$f_{p,m}$ Hz	$f_{p,rms}$ Hz	$T_{p,m}$ sec	$T_{p,rms}$ sec	$\theta_{p,m}$ deg	$\theta_{p,rms}$ deg	$\theta_{p,mv}$ deg	$\Delta\theta_{pm}$ deg	$\Delta\theta_{pr}$ deg	$\Delta\theta_{mr}$ deg
891101	0100	1.19	0.113	0.113	8.87	8.87	-34.0	-12.0	-23.4	29.3	27.7	25.4
891101	0700	1.04	0.123	0.113	8.16	8.87	-36.0	-18.0	-24.7	29.2	26.6	20.9
891101	1300	0.81	0.123	0.113	8.16	8.87	-38.0	-16.0	-25.5	31.1	28.9	24.2
891101	1900	0.94	0.113	0.113	8.87	8.87	-38.0	-12.0	-7.8	40.5	28.0	32.5
891102	0100	1.05	0.123	0.123	8.16	8.16	-38.0	-10.0	5.0	50.1	25.4	24.8
891102	0700	1.18	0.132	0.113	7.56	8.87	-38.0	34.0	9.7	51.5	31.7	26.3
891102	1300	1.04	0.201	0.210	4.98	4.75	40.0	-10.0	8.4	46.9	40.1	42.4
891102	1900	0.99	0.064	0.132	15.62	7.56	-14.0	26.0	5.7	52.5	33.8	19.6
891103	0100	1.20	0.220	0.210	4.54	4.75	40.0	36.0	12.1	47.5	29.5	27.0
891103	0700	1.03	0.064	0.220	15.62	4.54	-12.0	48.0	5.5	56.9	26.1	16.3
891103	1900	1.03	0.191	0.191	5.24	5.24	30.0	44.0	22.9	41.1	18.1	14.6
891104	0100	1.25	0.171	0.171	5.83	5.83	24.0	40.0	21.9	30.7	19.4	16.6
891104	0700	1.12	0.074	0.074	13.57	13.57	-12.0	-12.0	9.9	42.0	23.1	18.5
891105	1300	0.98	0.083	0.083	11.98	11.98	-14.0	-14.0	-11.3	26.8	26.0	21.1
891105	1900	0.96	0.083	0.083	11.98	11.98	-8.0	-8.0	-7.5	26.3	27.2	26.4
891106	0100	0.86	0.083	0.083	11.98	11.98	-14.0	-2.0	-4.9	29.0	29.5	23.8
891106	0700	0.80	0.083	0.083	11.98	11.98	-14.0	-14.0	-11.1	29.5	29.0	24.4
891106	1300	0.66	0.093	0.093	10.72	10.72	-12.0	-12.0	-21.0	31.3	31.5	23.2
891106	1900	0.60	0.093	0.093	10.72	10.72	-10.0	-8.0	-16.6	29.7	30.0	31.0
891107	0100	0.57	0.093	0.093	10.72	10.72	-12.0	-12.0	-17.6	29.8	30.0	26.5
891107	0700	0.53	0.103	0.103	9.71	9.71	-34.0	-12.0	-19.1	31.5	31.0	33.9
891107	1300	0.52	0.113	0.103	8.87	9.71	-34.0	-14.0	-23.5	31.2	30.8	24.8
891107	1900	0.48	0.103	0.103	9.71	9.71	-14.0	-18.0	-17.9	29.7	31.3	25.9
891108	0100	0.45	0.103	0.103	9.71	9.71	-26.0	-28.0	-24.6	32.2	31.7	27.5
891108	0700	0.48	0.113	0.113	8.87	8.87	-34.0	-32.0	-28.7	31.7	28.9	30.4
891108	1300	0.45	0.113	0.113	8.87	8.87	-24.0	-26.0	-27.9	31.5	30.9	30.4
891108	1900	0.41	0.113	0.113	8.87	8.87	-34.0	-32.0	-30.0	31.1	29.6	29.5
891109	0100	0.46	0.103	0.103	9.71	9.71	-24.0	-30.0	-34.3	35.3	26.0	25.6
891109	0700	0.51	0.103	0.103	9.71	9.71	-28.0	-58.0	-40.7	36.0	22.1	21.0
891109	1300	0.75	0.142	0.113	7.04	8.87	-42.0	-54.0	-42.9	26.2	14.0	15.2
891109	1900	0.68	0.142	0.113	7.04	8.87	-42.0	-40.0	-38.6	26.9	21.5	13.0
891110	0100	0.59	0.113	0.113	8.87	8.87	-38.0	-18.0	-30.5	31.1	28.2	23.7
891110	0700	0.63	0.113	0.113	8.87	8.87	-38.0	-40.0	-6.3	66.5	25.4	25.6
891110	1300	0.58	0.132	0.113	7.56	8.87	-42.0	-42.0	-22.5	36.8	32.0	20.2
891110	1900	0.58	0.093	0.093	10.72	10.72	-30.0	64.0	3.6	81.3	28.8	22.8
891111	0100	0.83	0.230	0.230	4.35	4.35	60.0	58.0	34.5	55.5	22.6	18.9
891111	0700	0.79	0.191	0.191	5.24	5.24	52.0	56.0	32.3	52.6	28.1	20.9
891111	1300	0.63	0.181	0.181	5.52	5.52	34.0	36.0	8.6	53.3	29.4	14.6
891111	1900	0.44	0.093	0.093	10.72	10.72	-12.0	-10.0	-15.8	32.8	32.2	22.9
891112	0100	0.38	0.103	0.103	9.71	9.71	-20.0	-14.0	-20.3	24.9	23.6	21.0
891112	0700	0.35	0.064	0.064	15.62	15.62	-8.0	-8.0	-20.4	27.8	23.4	18.4
891112	1300	0.36	0.064	0.064	15.62	15.62	-6.0	-8.0	-19.1	23.3	23.4	14.2
891112	1900	0.38	0.064	0.064	15.62	15.62	-8.0	-8.0	-25.1	30.0	28.8	16.4
891113	0100	0.67	0.289	0.289	3.47	3.47	6.0	-10.0	-0.6	33.3	28.4	28.2
891113	0700	0.86	0.230	0.230	4.35	4.35	-32.0	-30.0	1.9	52.2	45.3	60.0
891113	1300	0.82	0.220	0.220	4.54	4.54	54.0	18.0	12.0	50.9	40.2	50.7
891113	1900	0.68	0.181	0.181	5.52	5.52	30.0	22.0	-6.2	51.5	39.1	23.6
891114	0100	0.60	0.201	0.201	4.98	4.98	-44.0	-46.0	-33.8	37.6	27.1	17.2
891114	0700	0.78	0.191	0.181	5.24	5.52	-44.0	-46.0	-39.4	31.0	24.5	18.5
891114	1300	0.63	0.181	0.181	5.52	5.52	-44.0	-48.0	-37.5	31.0	22.2	23.2
891114	1900	0.64	0.191	0.181	5.24	5.52	-50.0	-48.0	-37.8	30.8	20.6	12.2

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,avg}$ Hz	$f_{p,spec}$ Hz	$T_{p,avg}$ sec	$T_{p,spec}$ sec	$\theta_{p,avg}$ deg	$\theta_{p,spec}$ deg	$\theta_{p,dir}$ deg	$\Delta\theta_{ms}$ deg	$\Delta\theta_{pm}$ deg	$\Delta\theta_{mp}$ deg
891115	0100	0.82	0.181	0.171	5.52	5.83	-42.0	-44.0	-41.6	22.4	15.8	9.1
891115	0700	0.93	0.162	0.162	6.19	6.19	-44.0	-44.0	-42.2	20.6	17.9	13.7
891115	1300	0.72	0.162	0.162	6.19	6.19	-40.0	-42.0	-38.6	21.7	15.4	11.2
891115	1900	0.80	0.162	0.142	6.19	7.04	-46.0	-44.0	-42.9	21.1	17.6	15.1
891116	0100	0.91	0.152	0.142	6.58	7.04	-42.0	-42.0	-44.2	20.1	14.9	13.2
891116	0700	1.61	0.132	0.123	7.56	8.16	-36.0	-38.0	-43.9	15.8	11.3	7.6
891116	1000	1.58	0.123	0.103	8.16	9.71	-36.0	-38.0	-43.1	15.6	13.0	8.6
891116	1300	0.91	0.123	0.103	8.16	9.71	-38.0	-38.0	-38.0	16.5	14.1	11.3
891116	1900	0.74	0.113	0.113	8.87	8.87	-38.0	-38.0	-12.2	54.9	25.9	19.7
891117	0100	0.82	0.240	0.103	4.17	9.71	58.0	60.0	18.5	81.7	15.7	8.2
891117	0700	0.83	0.103	0.103	9.71	9.71	-26.0	68.0	22.8	82.7	19.3	25.5
891117	1300	0.67	0.113	0.103	8.87	9.71	-26.0	-26.0	1.1	60.5	29.3	32.2
891117	1900	0.71	0.103	0.103	9.71	9.71	-22.0	-22.0	-7.2	44.7	33.0	32.4
891118	0100	0.59	0.103	0.103	9.71	9.71	-26.0	-24.0	-17.5	33.9	33.5	30.4
891118	0700	0.49	0.103	0.103	9.71	9.71	-14.0	-14.0	-19.4	27.4	26.3	24.9
891118	1300	0.45	0.103	0.103	9.71	9.71	-20.0	-20.0	-19.9	27.8	27.1	25.4
891118	1900	0.46	0.103	0.103	9.71	9.71	-16.0	-16.0	-19.9	28.8	26.8	27.7
891119	0100	0.90	0.220	0.103	4.54	9.71	56.0	58.0	42.2	31.3	14.3	9.0
891119	0700	1.28	0.162	0.162	6.19	6.19	30.0	32.0	31.8	27.5	22.7	15.5
891119	1300	1.04	0.171	0.162	5.83	6.19	38.0	32.0	30.8	29.3	23.5	14.3
891119	1900	0.62	0.103	0.103	9.71	9.71	-10.0	28.0	14.2	44.6	25.6	30.4
891120	0100	0.38	0.103	0.103	9.71	9.71	-16.0	-16.0	-12.4	35.5	31.4	29.1
891120	0700	0.26	0.103	0.103	9.71	9.71	-20.0	-34.0	-23.4	28.1	27.2	24.5
891120	1300	0.26	0.162	0.103	6.19	9.71	-42.0	-48.0	-39.9	31.0	18.8	4.5
891120	1900	0.44	0.142	0.142	7.04	7.04	-38.0	-38.0	-45.8	17.1	5.9	3.6
891121	0100	0.37	0.142	0.142	7.04	7.04	-40.0	-40.0	-42.4	9.0	8.9	3.6
891121	0700	1.46	0.171	0.152	5.83	6.58	46.0	40.0	44.4	24.0	14.5	11.8
891121	1300	1.51	0.132	0.132	7.56	7.56	26.0	30.0	37.5	28.2	16.6	11.5
891121	1900	1.20	0.142	0.142	7.04	7.04	20.0	38.0	38.2	28.9	18.2	17.7
891122	0100	1.59	0.152	0.152	6.58	6.58	38.0	38.0	41.5	27.1	19.3	16.7
891122	0700	1.19	0.142	0.113	7.04	8.87	24.0	24.0	30.6	30.7	21.8	14.0
891122	1300	1.00	0.123	0.123	8.16	8.16	6.0	20.0	23.9	29.0	25.9	25.4
891122	1900	1.19	0.230	0.220	4.35	4.54	30.0	18.0	23.9	31.0	26.8	21.7
891122	2200	2.00	0.162	0.171	6.19	5.83	26.0	24.0	14.8	32.6	31.8	22.8
891123	0100	2.08	0.162	0.162	6.19	6.19	18.0	36.0	5.1	61.0	32.8	25.0
891123	0400	2.06	0.152	0.152	6.58	6.58	38.0	40.0	16.1	43.0	28.7	31.3
891123	0700	2.60	0.142	0.142	7.04	7.04	16.0	46.0	32.0	28.6	24.9	25.9
891123	1000	2.27	0.142	0.132	7.04	7.56	36.0	44.0	34.2	31.0	27.3	23.8
891123	1300	1.80	0.132	0.132	7.56	7.56	24.0	44.0	25.1	33.8	26.9	25.7
891123	1900	1.67	0.113	0.113	8.87	8.87	14.0	20.0	24.0	30.6	25.3	32.0
891124	0100	1.73	0.103	0.103	9.71	9.71	16.0	16.0	18.9	29.7	26.5	32.1
891124	0700	1.39	0.093	0.093	10.72	10.72	-4.0	18.0	18.4	30.0	24.9	28.4
891124	1300	1.43	0.093	0.093	10.72	10.72	14.0	0.0	10.4	26.4	24.9	28.7
891124	1900	1.35	0.083	0.083	11.98	11.98	-16.0	4.0	-0.9	29.4	26.2	27.8
891125	0700	0.93	0.083	0.083	11.98	11.98	-12.0	-14.0	-11.2	24.3	25.2	21.4
891125	1300	0.73	0.083	0.083	11.98	11.98	-10.0	-12.0	-14.9	23.7	24.5	18.3
891125	1900	0.65	0.083	0.083	11.98	11.98	-12.0	-12.0	-21.6	23.7	16.4	14.2
891126	0100	0.44	0.093	0.093	10.72	10.72	-12.0	-16.0	-23.7	32.5	19.3	21.3
891126	0700	0.30	0.093	0.093	10.72	10.72	-18.0	-18.0	-30.5	32.4	21.9	18.8
891126	1300	0.22	0.093	0.093	10.72	10.72	-8.0	-8.0	-30.0	36.5	23.5	19.3
891126	1900	0.22	0.162	0.093	6.19	10.72	-46.0	-46.0	-39.3	39.9	36.4	9.8
891127	0100	0.78	0.279	0.279	3.59	3.59	48.0	46.0	32.6	28.3	25.8	24.2

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,JPO}$ Hz	$T_{p,PM}$ sec	$T_{p,JPO}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,JPO}$ deg	$\theta_{p,DIR}$ deg	$\Delta\theta_{90}$ deg	$\Delta\theta_{DIR}$ deg	$\Delta\theta_{mean}$ deg
891127	0700	0.90	0.210	0.201	4.75	4.98	48.0	46.0	37.7	29.9	27.9	23.8
891127	1300	1.08	0.191	0.191	5.24	5.24	20.0	20.0	13.2	32.8	32.6	17.6
891127	1900	0.86	0.191	0.210	5.24	4.75	24.0	24.0	23.5	36.4	34.5	22.9
891128	0100	0.80	0.201	0.201	4.98	4.98	-46.0	-46.0	-42.7	46.7	41.5	45.8
891128	0700	0.82	0.181	0.181	5.52	5.52	-46.0	-44.0	-44.0	26.9	24.7	16.5
891128	1300	0.66	0.162	0.162	6.19	6.19	-48.0	-48.0	-42.1	30.9	23.1	18.6
891128	1900	0.53	0.171	0.162	5.83	6.19	-48.0	-46.0	-47.2	29.9	19.9	16.6
891129	0100	1.38	0.191	0.191	5.24	5.24	34.0	52.0	42.7	22.4	19.6	15.8
891129	0700	1.78	0.152	0.152	6.58	6.58	42.0	54.0	45.7	25.9	21.4	21.6
891129	1300	1.47	0.162	0.162	6.19	6.19	28.0	40.0	39.7	26.4	20.3	20.2
891129	1900	1.45	0.152	0.152	6.58	6.58	24.0	24.0	35.5	26.5	21.1	13.5
891130	0100	1.15	0.152	0.152	6.58	6.58	20.0	26.0	32.1	26.7	21.7	16.5
891130	0700	0.86	0.142	0.152	7.04	6.58	20.0	20.0	26.9	26.7	24.2	16.0
891130	1300	0.37	0.142	0.142	7.04	7.04	10.0	12.0	11.3	39.2	27.9	32.0
891130	1900	0.29	0.074	0.074	13.57	13.57	-12.0	-12.0	-5.8	34.9	29.8	21.4
891201	0100	0.45	0.318	0.308	3.15	3.25	60.0	60.0	43.7	30.6	20.5	16.7
891201	0700	1.27	0.142	0.142	7.04	7.04	16.0	28.0	31.3	27.6	25.7	21.9
891201	1300	0.76	0.152	0.152	6.58	6.58	22.0	38.0	32.4	28.0	23.6	18.3
891201	1900	0.56	0.201	0.201	4.98	4.98	36.0	30.0	26.2	33.5	29.7	23.1
891202	0100	0.50	0.142	0.142	7.04	7.04	16.0	16.0	17.9	36.7	27.8	26.9
891202	0700	0.58	0.171	0.171	5.83	5.83	28.0	22.0	12.1	44.3	31.3	21.4
891202	1300	0.58	0.113	0.113	8.87	8.87	-24.0	-24.0	-18.0	32.9	30.7	19.7
891202	1900	0.60	0.113	0.113	8.87	8.87	-26.0	-26.0	-32.5	37.9	19.7	19.3
891203	0100	0.45	0.142	0.113	7.04	8.87	-44.0	-42.0	-38.9	38.8	19.5	6.4
891203	0700	0.94	0.171	0.162	5.83	6.19	42.0	50.0	40.8	19.5	16.5	8.8
891203	1300	1.14	0.142	0.142	7.04	7.04	22.0	56.0	38.4	26.1	14.9	15.0
891203	1900	1.26	0.191	0.181	5.24	5.52	50.0	58.0	44.8	22.5	12.9	9.7
891204	0100	1.44	0.142	0.132	7.04	7.56	28.0	44.0	40.3	26.5	15.6	16.5
891205	1900	0.35	0.132	0.093	7.56	10.72	-38.0	-38.0	-32.3	37.7	30.9	10.5
891206	0100	0.29	0.132	0.093	7.56	10.72	-40.0	-40.0	-25.5	39.6	34.8	26.8
891206	0700	0.28	0.074	0.074	13.57	13.57	0.0	-8.0	-21.1	36.3	31.7	21.9
891206	1900	0.43	0.308	0.298	3.25	3.35	-58.0	-56.0	-42.1	27.2	11.8	7.1
891207	0100	0.38	0.142	0.142	7.04	7.04	-42.0	-40.0	-42.1	25.1	12.9	6.2
891207	0700	0.71	0.250	0.279	4.01	3.59	58.0	60.0	41.6	27.4	15.0	7.0
891207	1900	1.39	0.181	0.162	5.52	6.19	30.0	30.0	35.3	26.2	23.2	14.0
891208	0100	1.63	0.171	0.171	5.83	5.83	24.0	38.0	32.9	30.0	29.1	24.0
891208	0700	2.47	0.152	0.152	6.58	6.58	16.0	18.0	25.8	32.9	31.7	31.6
891208	1000	2.75	0.142	0.142	7.04	7.04	20.0	14.0	20.3	33.0	33.5	33.6
891208	1300	2.98	0.132	0.132	7.56	7.56	16.0	10.0	18.4	34.3	34.3	33.2
891208	1600	3.35	0.123	0.132	8.16	7.56	16.0	16.0	16.4	36.8	34.0	32.2
891208	1900	3.83	0.113	0.113	8.87	8.87	16.0	10.0	17.4	31.2	30.3	29.3
891208	2200	4.06	0.103	0.113	9.71	8.87	-8.0	8.0	12.5	31.8	31.7	31.8
891209	0100	4.06	0.103	0.103	9.71	9.71	-2.0	4.0	10.2	33.7	33.2	31.0
891209	0400	3.70	0.103	0.103	9.71	9.71	14.0	12.0	19.4	36.8	33.8	32.9
891209	0700	3.59	0.093	0.093	10.72	10.72	-12.0	14.0	14.4	33.4	31.8	26.7
891209	1000	3.52	0.093	0.093	10.72	10.72	-10.0	4.0	9.7	31.8	30.9	26.4
891209	1300	3.76	0.093	0.093	10.72	10.72	-14.0	2.0	12.2	34.2	32.5	28.8
891209	1600	4.03	0.093	0.113	10.72	8.87	-12.0	4.0	10.0	33.2	32.0	30.4
891209	1900	4.17	0.093	0.093	10.72	10.72	-8.0	0.0	4.0	29.4	29.7	26.9
891209	2200	4.03	0.093	0.093	10.72	10.72	-10.0	2.0	2.1	31.0	30.4	25.8
891210	0100	4.09	0.093	0.093	10.72	10.72	-14.0	0.0	4.1	33.6	34.0	30.2

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,SPE}$ Hz	$T_{p,PM}$ sec	$T_{p,SPE}$ sec	$\theta_{o,PM}$ deg	$\theta_{o,SPE}$ deg	$\theta_{o,DIR}$ deg	$\Delta\theta_{PM}$ deg	$\Delta\theta_{SPE}$ deg	$\Delta\theta_{DIR}$ deg
891210	0400	3.77	0.083	0.093	11.98	10.72	-22.0	-4.0	7.9	40.9	34.3	25.3
891210	0700	3.30	0.093	0.093	10.72	10.72	-18.0	-8.0	-0.5	37.2	35.0	29.6
891210	1000	2.88	0.083	0.083	11.98	11.98	-16.0	-14.0	-3.6	35.1	33.2	28.4
891210	1600	2.14	0.093	0.093	10.72	10.72	-18.0	-6.0	-11.9	35.1	33.2	28.9
891210	1900	1.84	0.093	0.093	10.72	10.72	-12.0	-12.0	-10.7	34.7	32.8	29.6
891211	0100	1.62	0.093	0.093	10.72	10.72	-30.0	-26.0	-19.7	34.1	32.8	31.8
891211	0700	1.32	0.103	0.093	9.71	10.72	-30.0	-20.0	-21.0	31.1	31.1	28.6
891211	1900	0.65	0.093	0.093	10.72	10.72	-12.0	-12.0	-13.9	26.7	27.6	21.8
891212	0100	0.52	0.103	0.103	9.71	9.71	-16.0	-12.0	-20.1	31.1	31.6	25.6
891212	0700	0.50	0.103	0.103	9.71	9.71	-22.0	-24.0	-29.3	27.8	27.6	18.6
891212	1300	0.45	0.103	0.103	9.71	9.71	-30.0	-26.0	-7.5	40.4	29.4	28.0
891212	1900	0.59	0.279	0.279	3.59	3.59	70.0	66.0	40.1	72.9	48.5	51.7
891213	0100	1.47	0.201	0.181	4.98	5.52	48.0	48.0	43.6	17.2	15.2	12.5
891213	0400	1.96	0.162	0.162	6.19	6.19	30.0	52.0	40.7	23.4	20.9	19.4
891213	0700	2.66	0.142	0.132	7.04	7.56	44.0	48.0	43.7	27.5	26.7	22.6
891213	1300	2.87	0.103	0.103	9.71	9.71	22.0	20.0	28.1	31.5	28.4	30.6
891213	1600	2.70	0.093	0.103	10.72	9.71	6.0	4.0	20.1	27.8	25.2	16.5
891213	1900	2.34	0.093	0.103	10.72	9.71	0.0	0.0	16.4	26.3	24.5	18.3
891214	0100	1.63	0.103	0.103	9.71	9.71	-2.0	0.0	2.8	22.9	22.1	20.1
891214	0700	1.30	0.093	0.093	10.72	10.72	-14.0	4.0	0.0	29.4	26.3	26.8
891214	1300	0.99	0.093	0.093	10.72	10.72	-16.0	-12.0	-0.3	38.7	30.9	33.0
891214	1900	0.88	0.093	0.093	10.72	10.72	-12.0	-12.0	-3.7	36.8	28.8	26.9
891215	0100	0.69	0.103	0.103	9.71	9.71	-16.0	-12.0	-2.7	38.8	33.5	37.5
891215	1300	0.52	0.318	0.103	3.15	9.71	-56.0	-14.0	-29.7	42.7	19.8	9.4
891215	1900	0.39	0.064	0.064	15.62	15.62	-10.0	-12.0	-22.7	29.6	19.9	19.3
891216	0100	0.45	0.269	0.269	3.72	3.72	74.0	74.0	22.9	99.5	20.0	5.1
891216	0700	1.33	0.181	0.181	5.52	5.52	44.0	60.0	48.9	22.1	16.5	13.2
891216	1300	1.21	0.152	0.162	6.58	6.19	42.0	42.0	41.9	27.8	19.7	19.2
891217	1900	0.78	0.054	0.054	18.45	18.45	-12.0	58.0	26.1	55.6	26.5	15.5
891218	0100	0.63	0.054	0.054	18.45	18.45	-16.0	-16.0	10.1	49.4	23.6	14.4
891218	0700	0.61	0.064	0.054	15.62	18.45	-10.0	48.0	16.3	53.4	22.2	15.8
891218	1900	1.07	0.191	0.191	5.24	5.24	32.0	46.0	33.4	24.5	17.8	15.1
891219	0100	1.17	0.181	0.171	5.52	5.83	24.0	40.0	30.4	24.2	21.1	19.2
891219	0700	0.90	0.171	0.181	5.83	5.52	22.0	22.0	29.6	27.2	23.2	16.8
891219	1300	0.82	0.201	0.201	4.98	4.98	38.0	38.0	27.7	35.5	29.0	21.7
891219	1900	1.09	0.191	0.191	5.24	5.24	20.0	40.0	26.6	33.7	28.9	26.4
891220	0100	1.27	0.162	0.162	6.19	6.19	16.0	38.0	19.8	32.5	25.4	25.3
891220	0700	1.41	0.171	0.171	5.83	5.83	42.0	42.0	31.1	28.6	23.0	22.0
891220	1300	1.57	0.142	0.142	7.04	7.04	22.0	44.0	34.1	26.2	20.5	23.3
891220	1900	0.97	0.152	0.152	6.58	6.58	34.0	28.0	24.4	30.6	22.2	24.7
891221	0100	0.77	0.064	0.064	15.62	15.62	-18.0	28.0	11.3	39.4	22.7	23.3
891221	0700	0.67	0.064	0.064	15.62	15.62	-14.0	-14.0	2.3	35.3	23.8	25.6
891221	1300	0.69	0.064	0.064	15.62	15.62	-10.0	-10.0	-6.8	26.5	25.1	22.6
891221	1900	0.88	0.064	0.064	15.62	15.62	-10.0	66.0	23.9	69.8	21.5	21.9
891221	2200	1.69	0.201	0.201	4.98	4.98	52.0	56.0	42.6	22.6	17.5	15.4
891222	0100	2.25	0.152	0.152	6.58	6.58	44.0	52.0	39.5	26.0	19.8	20.6
891222	0400	2.33	0.132	0.142	7.56	7.04	26.0	50.0	39.4	28.6	20.5	22.1
891222	0700	2.11	0.142	0.142	7.04	7.04	20.0	52.0	31.0	30.3	21.3	21.5
891222	1000	2.15	0.152	0.152	6.58	6.58	28.0	52.0	34.2	30.9	22.9	20.0
891222	1300	1.90	0.142	0.132	7.04	7.56	24.0	54.0	30.5	34.1	21.6	20.9
891222	1600	1.63	0.132	0.123	7.56	8.16	22.0	26.0	31.0	33.6	21.6	20.7
891222	1900	1.52	0.064	0.152	15.62	6.58	-8.0	24.0	29.5	32.4	21.7	15.5

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,avg}$ Hz	$f_{p,spec}$ Hz	$T_{p,avg}$ sec	$T_{p,spec}$ sec	$\theta_{p,avg}$ deg	$\theta_{p,spec}$ deg	$\theta_{p,mom}$ deg	$\Delta\theta_{pc}$ deg	$\Delta\theta_{mm}$ deg	$\Delta\theta_{mom}$ deg
891222	2200	1.70	0.171	0.171	5.83	5.83	34.0	54.0	35.0	31.6	21.0	19.5
891223	0100	1.80	0.152	0.152	6.58	6.58	30.0	54.0	37.3	32.4	22.9	24.4
891223	0400	1.81	0.152	0.152	6.58	6.58	28.0	52.0	39.4	29.8	22.9	25.4
891223	0700	1.93	0.162	0.162	6.19	6.19	44.0	50.0	41.4	27.3	22.3	22.6
891223	1000	2.01	0.152	0.152	6.58	6.58	26.0	52.0	38.9	27.2	21.6	22.9
891223	1300	2.44	0.152	0.142	6.58	7.04	30.0	50.0	37.3	27.6	23.8	24.7
891223	1600	2.97	0.142	0.132	7.04	7.56	40.0	48.0	37.6	28.2	25.6	23.6
891223	1900	3.46	0.132	0.132	7.56	7.56	36.0	44.0	34.3	30.4	28.6	31.4
891223	2200	3.66	0.123	0.123	8.16	8.16	26.0	44.0	33.9	31.2	28.7	30.6
891224	0100	3.79	0.318	0.113	3.15	8.87	42.0	44.0	34.4	32.5	30.4	19.7
891224	0400	4.18	0.318	0.113	3.15	8.87	40.0	42.0	26.9	32.3	29.2	22.0
891224	0700	4.27	0.103	0.103	9.71	9.71	22.0	42.0	27.8	32.7	30.1	32.7
891224	1000	4.47	0.093	0.093	10.72	10.72	-4.0	12.0	18.0	31.6	29.8	32.3
891224	1300	4.68	0.093	0.093	10.72	10.72	18.0	2.0	11.7	31.1	31.0	29.6
891224	1600	4.46	0.074	0.074	13.57	13.57	-18.0	0.0	6.9	33.0	32.4	30.1
891224	1900	4.03	0.074	0.074	13.57	13.57	-16.0	10.0	8.5	34.2	33.2	29.3
891224	2200	3.85	0.074	0.074	13.57	13.57	-16.0	-4.0	-4.2	30.2	30.1	28.2
891225	0100	3.71	0.074	0.074	13.57	13.57	-24.0	-8.0	-13.7	30.2	29.7	29.1
891225	0400	3.16	0.074	0.074	13.57	13.57	-20.0	-6.0	-9.0	34.0	33.5	34.0
891225	0700	2.71	0.074	0.074	13.57	13.57	-22.0	-6.0	-11.9	32.7	32.3	32.5
891225	1000	2.73	0.083	0.074	11.98	13.57	-16.0	-8.0	-12.3	26.4	26.7	25.8
891225	1300	2.54	0.083	0.074	11.98	13.57	-20.0	-10.0	-12.5	27.9	27.8	30.4
891225	1600	2.31	0.083	0.083	11.98	11.98	-18.0	-8.0	-13.0	28.9	28.4	29.3
891225	1900	1.96	0.074	0.074	13.57	13.57	-16.0	-8.0	-11.4	28.0	28.1	29.3
891225	2200	1.77	0.074	0.074	13.57	13.57	-14.0	-8.0	-12.2	26.8	27.4	29.1
891226	1300	0.93	0.074	0.074	13.57	13.57	-12.0	-12.0	-12.3	24.8	25.5	24.6
891227	0100	1.29	0.230	0.210	4.35	4.75	60.0	40.0	38.6	33.2	21.3	19.1
891227	0400	1.47	0.181	0.181	5.52	5.52	50.0	38.0	41.2	29.8	22.6	16.0
891227	0700	1.46	0.142	0.142	7.04	7.04	42.0	30.0	40.4	29.3	25.2	23.6
891227	1300	0.90	0.171	0.162	5.83	6.19	36.0	36.0	31.2	36.0	28.6	18.1
891227	1900	0.65	0.064	0.132	15.62	7.56	-10.0	16.0	20.8	43.6	32.8	13.2
891228	0100	0.49	0.152	0.152	6.58	6.58	18.0	10.0	10.5	44.7	36.2	37.6
891228	0700	0.29	0.064	0.064	15.62	15.62	-8.0	16.0	-2.5	43.6	35.9	22.5
891228	1300	0.45	0.269	0.250	3.72	4.01	58.0	58.0	27.3	58.7	23.6	15.7
891228	1900	0.51	0.210	0.210	4.75	4.75	36.0	38.0	16.0	43.0	26.4	20.5
891229	0100	0.49	0.152	0.152	6.58	6.58	8.0	8.0	15.1	34.6	25.3	18.9
891229	0700	0.45	0.064	0.142	15.62	7.04	-14.0	12.0	5.0	39.7	31.5	23.1
891229	1300	0.46	0.162	0.152	6.19	6.58	6.0	6.0	-2.8	32.9	28.7	33.9
891229	1900	0.46	0.181	0.181	5.52	5.52	8.0	8.0	-1.3	36.6	28.6	16.6
891230	0100	0.39	0.103	0.103	9.71	9.71	-32.0	10.0	-4.3	41.3	29.8	30.1
891230	0700	0.43	0.201	0.103	4.98	9.71	-54.0	-54.0	-35.0	47.8	43.9	61.7
891230	1300	0.48	0.162	0.152	6.19	6.58	-48.0	-48.0	-43.9	37.7	29.1	16.1
891230	1900	0.49	0.162	0.142	6.19	7.04	-48.0	-50.0	-40.5	42.3	38.4	34.4
891231	0100	0.45	0.171	0.103	5.83	9.71	-52.0	-36.0	-38.6	41.3	36.8	25.8
891231	0700	0.49	0.103	0.103	9.71	9.71	-38.0	-38.0	-37.9	37.5	34.1	25.8
891231	1300	0.58	0.318	0.103	3.15	9.71	-64.0	-64.0	-39.0	52.2	32.0	7.8
891231	1900	0.91	0.123	0.113	8.16	8.87	-42.0	-40.0	-44.4	24.4	25.5	14.3
900101	0100	0.84	0.113	0.113	8.87	8.87	-36.0	-40.0	-41.9	22.1	19.4	17.4
900101	0700	0.93	0.103	0.103	9.71	9.71	-40.0	-42.0	-5.6	84.9	22.2	18.9
900101	1300	1.01	0.181	0.171	5.52	5.83	42.0	32.0	20.1	56.8	27.8	16.1
900101	1900	0.83	0.113	0.210	8.87	4.75	-38.0	50.0	23.4	58.3	24.0	19.4
900102	0100	0.68	0.210	0.103	4.75	9.71	50.0	50.0	23.1	51.6	21.5	12.4
900102	0700	0.68	0.103	0.103	9.71	9.71	-32.0	36.0	17.8	48.6	24.2	25.3

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,SPE}$ Hz	$T_{p,PM}$ sec	$T_{p,SPE}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,SPE}$ deg	$\theta_{p,MEM}$ deg	$\Delta\theta_{PM}$ deg	$\Delta\theta_{SPE}$ deg	$\Delta\theta_{MEM}$ deg
900102	1300	0.58	0.064	0.103	15.62	9.71	-14.0	16.0	6.1	39.8	26.3	23.0
900102	1900	0.53	0.064	0.103	15.62	9.71	-10.0	-6.0	-4.8	32.9	27.1	15.8
900103	0100	0.41	0.103	0.103	9.71	9.71	-28.0	-12.0	-11.6	33.9	30.2	22.2
900103	0700	0.38	0.113	0.103	8.87	9.71	-30.0	-14.0	-20.2	29.0	27.6	21.4
900103	1000	0.37	0.103	0.103	9.71	9.71	-34.0	-32.0	-23.6	28.9	26.3	25.9
900103	1300	0.36	0.103	0.103	9.71	9.71	-36.0	-14.0	-24.1	30.1	28.7	30.0
900103	1900	0.37	0.103	0.103	9.71	9.71	-34.0	-34.0	-27.6	28.4	26.3	26.6
900104	0100	0.36	0.113	0.103	8.87	9.71	-36.0	-36.0	-31.2	24.9	21.6	19.1
900104	0700	0.37	0.103	0.103	9.71	9.71	-34.0	-34.0	-28.7	23.9	21.8	19.2
900104	1300	0.41	0.103	0.103	9.71	9.71	-38.0	-38.0	-35.1	26.0	20.3	20.2
900104	1900	0.60	0.152	0.103	6.58	9.71	-44.0	-46.0	-42.9	20.0	13.0	7.1
900105	0100	0.59	0.152	0.103	6.58	9.71	-46.0	-48.0	-41.3	25.2	16.4	8.8
900105	0700	0.53	0.152	0.103	6.58	9.71	-46.0	-44.0	-40.5	23.4	15.3	11.4
900105	1300	0.49	0.142	0.142	7.04	7.04	-44.0	-46.0	-42.8	25.7	18.0	12.8
900105	1900	0.45	0.103	0.103	9.71	9.71	-38.0	-40.0	-30.0	30.2	28.5	20.8
900106	0100	0.67	0.103	0.103	9.71	9.71	-32.0	-40.0	-3.8	61.6	25.5	18.4
900106	0700	0.64	0.103	0.103	9.71	9.71	-34.0	-36.0	-1.9	53.1	31.4	18.8
900106	1300	0.63	0.181	0.181	5.52	5.52	28.0	-2.0	-4.2	42.2	34.7	37.6
900106	1900	0.49	0.103	0.103	9.71	9.71	-34.0	-32.0	3.6	47.1	26.1	22.2
900107	0100	0.49	0.103	0.103	9.71	9.71	-32.0	-26.0	-4.7	49.1	24.1	23.5
900107	0700	0.49	0.103	0.113	9.71	8.87	-36.0	-34.0	-10.3	40.6	27.7	27.2
900107	1300	0.61	0.113	0.103	8.87	9.71	-34.0	22.0	1.8	45.5	25.8	17.8
900107	1900	0.55	0.103	0.103	9.71	9.71	-32.0	-32.0	-2.5	43.4	28.9	16.8
900108	0100	0.59	0.123	0.113	8.16	8.87	-32.0	-32.0	-11.8	39.8	39.8	20.8
900108	0700	0.59	0.113	0.113	8.87	8.87	-36.0	-34.0	-23.6	41.3	38.4	25.9
900108	1300	1.10	0.142	0.152	7.04	6.58	-40.0	-30.0	-9.8	41.3	32.8	19.6
900108	1900	0.87	0.142	0.152	7.04	6.58	20.0	28.0	12.9	52.0	34.5	36.5
900109	0100	0.70	0.201	0.152	4.98	6.58	46.0	44.0	11.6	42.1	27.1	15.5
900109	0700	0.70	0.162	0.142	6.19	7.04	28.0	24.0	22.7	42.0	34.2	13.9
900109	1300	0.89	0.142	0.123	7.04	8.16	34.0	24.0	21.3	43.6	39.2	38.4
900109	1900	0.72	0.103	0.103	9.71	9.71	16.0	18.0	14.7	37.8	37.2	32.3
900110	0100	0.57	0.113	0.113	8.87	8.87	0.0	10.0	-7.3	46.4	36.4	43.5
900110	0700	0.48	0.162	0.113	6.19	8.87	-52.0	-52.0	-33.9	52.3	26.6	7.1
900110	1300	0.36	0.142	0.113	7.04	8.87	-40.0	-40.0	-18.2	51.1	33.2	20.9
900110	1900	0.39	0.318	0.318	3.15	3.15	64.0	64.0	12.6	90.2	37.3	7.4
900111	0100	0.28	0.132	0.113	7.56	8.87	-40.0	6.0	-4.3	46.0	41.9	47.0
900111	0700	0.30	0.083	0.083	11.98	11.98	16.0	16.0	-14.1	42.7	37.9	26.7
900111	1300	0.51	0.308	0.093	3.25	10.72	-58.0	-56.0	-35.2	49.0	16.6	6.0
900111	1900	0.38	0.318	0.083	3.15	11.98	-56.0	-56.0	-36.9	45.3	14.9	6.1
900112	0100	0.36	0.132	0.132	7.56	7.56	-40.0	-62.0	-42.8	34.5	12.7	5.6
900112	0700	0.37	0.123	0.132	8.16	7.56	-40.0	-42.0	-40.7	35.0	26.4	9.4
900112	1300	0.30	0.132	0.083	7.56	11.98	-40.0	-40.0	-14.7	53.6	31.9	9.0
900112	1900	0.34	0.308	0.093	3.25	10.72	62.0	62.0	9.8	84.0	26.3	6.4
900113	0100	0.54	0.240	0.250	4.17	4.01	58.0	60.0	49.0	15.1	13.0	7.5
900113	0700	0.94	0.201	0.181	4.98	5.52	54.0	52.0	47.9	23.2	13.9	10.0
900113	1300	0.76	0.181	0.181	5.52	5.52	50.0	50.0	42.5	21.4	15.2	12.3
900113	1900	0.56	0.181	0.181	5.52	5.52	44.0	46.0	33.3	25.8	15.4	9.4
900114	0100	0.42	0.181	0.181	5.52	5.52	34.0	34.0	22.9	37.5	19.1	8.0
900114	0700	0.53	0.152	0.152	6.58	6.58	20.0	22.0	20.8	29.0	19.8	15.6
900114	1300	0.50	0.142	0.162	7.04	6.19	20.0	30.0	22.0	30.9	21.5	19.8
900114	1900	0.54	0.181	0.162	5.52	6.19	24.0	26.0	18.2	28.7	21.9	14.5

Table A1 (Continued)

Date	Time EST	H_{m_o} m	$f_{p,PM}$ Hz	$f_{p,JPM}$ Hz	$T_{p,PM}$ sec	$T_{p,JPM}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,JPM}$ deg	$\theta_{p,DIR}$ deg	$\Delta\theta_{90}$ deg	$\Delta\theta_{DIR}$ deg	$\Delta\theta_{max}$ deg
900115	0100	0.35	0.181	0.162	5.52	6.19	24.0	24.0	10.4	39.5	29.3	15.6
900115	0700	0.26	0.132	0.123	7.56	8.16	-12.0	0.0	-11.8	38.9	38.7	31.4
900115	1300	0.24	0.142	0.093	7.04	10.72	-10.0	-10.0	-23.6	36.7	32.7	18.4
900115	1900	0.25	0.113	0.103	8.87	9.71	-34.0	-14.0	-35.5	42.6	31.1	40.6
900116	0100	0.24	0.103	0.093	9.71	10.72	-32.0	-60.0	-38.3	45.8	31.7	32.2
900116	0700	0.28	0.103	0.103	9.71	9.71	-32.0	-36.0	-38.4	38.6	32.7	23.2
900116	1300	0.31	0.113	0.103	8.87	9.71	-34.0	-36.0	-41.6	36.9	27.1	23.1
900116	1900	0.33	0.113	0.103	8.87	9.71	-36.0	-36.0	-36.8	30.5	30.2	21.3
900117	0100	0.33	0.103	0.103	9.71	9.71	-36.0	-36.0	-31.8	29.0	27.5	24.1
900117	0700	0.38	0.103	0.103	9.71	9.71	-36.0	-36.0	-32.3	26.5	25.7	19.6
900117	1900	0.47	0.103	0.103	9.71	9.71	-34.0	-34.0	-28.8	26.0	27.8	18.1
900118	0100	0.53	0.103	0.103	9.71	9.71	-34.0	-36.0	-25.1	25.0	28.1	16.7
900118	0700	0.46	0.103	0.103	9.71	9.71	-32.0	-34.0	-26.8	26.9	29.3	22.2
900118	1300	0.45	0.103	0.103	9.71	9.71	-34.0	-36.0	-28.8	28.4	31.4	19.3
900118	1900	0.45	0.103	0.103	9.71	9.71	-30.0	-32.0	-32.6	24.6	27.6	15.4
900119	0100	0.44	0.093	0.103	10.72	9.71	-32.0	-32.0	-27.8	27.9	23.3	11.2
900119	0700	0.87	0.230	0.269	4.35	3.72	60.0	62.0	44.0	38.9	20.8	8.6
900119	1300	1.32	0.152	0.152	6.58	6.58	20.0	18.0	24.0	26.5	24.5	15.3
900119	1900	1.21	0.152	0.152	6.58	6.58	24.0	22.0	25.1	35.2	28.6	20.3
900120	0100	1.04	0.113	0.103	8.87	9.71	-14.0	-14.0	14.6	50.7	25.1	14.0
900120	0700	0.99	0.103	0.103	9.71	9.71	-16.0	-16.0	4.6	37.4	29.5	15.1
900120	1300	0.87	0.103	0.103	9.71	9.71	-32.0	10.0	3.2	39.7	30.0	19.9
900120	1900	0.70	0.093	0.093	10.72	10.72	-24.0	-34.0	-14.0	40.3	34.3	18.3
900121	0100	0.67	0.103	0.093	9.71	10.72	-36.0	-36.0	-35.6	28.6	31.4	18.5
900121	0700	0.60	0.093	0.093	10.72	10.72	-30.0	-32.0	-40.1	30.1	25.1	18.3
900121	1300	0.64	0.152	0.093	6.58	10.72	-44.0	-46.0	-44.4	25.1	18.1	8.2
900121	1900	0.56	0.132	0.132	7.56	7.56	-42.0	-42.0	-37.6	24.5	19.9	5.8
900122	0100	0.61	0.132	0.113	7.56	8.87	-42.0	-42.0	-39.5	31.1	25.8	6.1
900122	0700	0.78	0.132	0.191	7.56	5.24	-42.0	12.0	-6.2	39.5	28.4	5.4
900122	1300	0.68	0.103	0.103	9.71	9.71	-36.0	-8.0	-9.6	35.0	25.8	21.3
900122	1900	0.62	0.093	0.123	10.72	8.16	-18.0	-10.0	0.4	45.7	32.6	17.7
900123	0100	0.52	0.103	0.103	9.71	9.71	-34.0	-36.0	-32.0	45.6	49.4	33.9
900123	1300	0.64	0.103	0.103	9.71	9.71	-2.0	12.0	1.3	35.4	36.0	29.2
900124	1300	0.78	0.103	0.103	9.71	9.71	-16.0	-14.0	-30.9	41.3	33.6	36.4
900125	0700	0.63	0.181	0.064	5.52	15.62	-50.0	-44.0	-39.0	38.5	19.0	9.1
900125	1300	0.86	0.152	0.132	6.58	7.56	-44.0	-44.0	-40.9	18.8	13.4	7.6
900125	1900	0.79	0.142	0.123	7.04	8.16	-44.0	-44.0	-45.2	21.3	16.2	14.1
900126	0100	0.90	0.123	0.123	8.16	8.16	-36.0	-42.0	-41.6	18.3	13.5	14.3
900126	0700	0.82	0.123	0.113	8.16	8.87	-40.0	-40.0	-36.7	20.4	19.9	10.4
900126	1300	1.14	0.103	0.103	9.71	9.71	-34.0	-36.0	10.2	78.6	19.0	16.0
900126	1900	0.76	0.210	0.103	4.75	9.71	50.0	-40.0	10.4	76.7	22.7	11.2
900127	0100	0.46	0.113	0.113	8.87	8.87	-36.0	-36.0	-9.5	56.6	26.8	18.2
900127	0700	0.47	0.132	0.113	7.56	8.87	-44.0	-44.0	-19.5	47.6	43.3	45.2
900127	1300	0.47	0.103	0.103	9.71	9.71	-32.0	10.0	-22.5	39.4	38.9	27.3
900127	1900	0.48	0.113	0.103	8.87	9.71	-36.0	-38.0	-14.1	41.2	35.1	30.6
900128	0100	0.48	0.103	0.103	9.71	9.71	-34.0	-34.0	-26.6	32.9	32.3	25.6
900128	0700	0.57	0.103	0.103	9.71	9.71	-34.0	-30.0	-32.9	26.2	25.0	23.9
900128	1300	0.56	0.103	0.093	9.71	10.72	-36.0	-34.0	-31.2	27.4	26.8	33.1
900128	1900	0.66	0.093	0.093	10.72	10.72	-10.0	-36.0	-25.6	30.3	29.2	30.7
900129	0100	0.69	0.093	0.093	10.72	10.72	-38.0	-36.0	-32.2	33.9	33.6	40.3

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,JON}$ Hz	$f_{p,PM}$ Hz	$T_{p,JON}$ sec	$T_{p,PM}$ sec	$\theta_{p,JON}$ deg	$\theta_{p,PM}$ deg	$\theta_{p,DIR}$ deg	$\Delta\theta_{JON}$ deg	$\Delta\theta_{DIR}$ deg	$\Delta\theta_{PEAK}$ deg
900129	0700	0.81	0.093	0.093	10.72	10.72	-6.0	-38.0	-23.8	31.3	29.3	30.8
900129	1300	0.74	0.093	0.093	10.72	10.72	-36.0	-36.0	-30.7	32.5	31.1	35.4
900129	1900	0.88	0.093	0.093	10.72	10.72	-38.0	-36.0	-40.9	37.6	27.8	32.7
900130	0100	0.99	0.123	0.123	8.16	8.16	-38.0	-36.0	-36.3	29.3	27.1	13.0
900130	0700	0.77	0.113	0.093	8.87	10.72	-38.0	-38.0	-13.5	57.4	31.3	24.1
900130	1300	0.75	0.123	0.093	8.16	10.72	-40.0	-36.0	-26.7	36.2	33.6	23.5
900130	1900	0.79	0.093	0.093	10.72	10.72	-28.0	-26.0	-32.4	36.1	36.4	29.8
900131	0100	0.73	0.093	0.093	10.72	10.72	-36.0	-34.0	-25.5	35.7	31.4	25.5
900131	0700	0.79	0.083	0.093	11.98	10.72	-20.0	-22.0	-22.0	31.0	28.7	22.7
900131	1300	0.69	0.093	0.093	10.72	10.72	-36.0	-36.0	-21.7	34.1	30.6	32.6
900131	1900	0.87	0.103	0.093	9.71	10.72	-34.0	-32.0	-15.4	34.2	28.2	30.1
900201	0100	0.96	0.093	0.093	10.72	10.72	-26.0	2.0	-19.8	36.0	33.0	31.3
900201	0700	0.95	0.093	0.093	10.72	10.72	-36.0	-36.0	-20.8	36.1	32.7	33.3
900201	1900	0.83	0.093	0.103	10.72	9.71	-30.0	-36.0	-35.1	34.6	33.9	30.4
900202	0100	0.80	0.103	0.103	9.71	9.71	-34.0	-32.0	-30.5	35.4	33.3	33.4
900202	0700	0.68	0.064	0.103	15.62	9.71	-8.0	-36.0	-34.2	36.5	30.4	19.2
900202	1300	0.65	0.064	0.093	15.62	10.72	-8.0	-40.0	-33.7	35.5	23.3	15.5
900202	1900	0.61	0.171	0.103	5.83	9.71	-46.0	-44.0	-36.6	36.1	19.3	14.0
900203	0100	0.61	0.152	0.103	6.58	9.71	-46.0	-44.0	-36.9	37.8	18.9	8.6
900203	0700	0.54	0.064	0.064	15.62	15.62	-6.0	-38.0	-29.5	37.8	22.5	22.9
900203	1300	0.70	0.298	0.298	3.35	3.35	22.0	20.0	0.7	46.8	29.1	22.0
900203	1900	0.99	0.191	0.201	5.24	4.98	2.0	2.0	7.7	38.5	31.0	17.0
900204	0100	1.01	0.162	0.162	6.19	6.19	4.0	4.0	6.0	35.2	32.7	29.7
900204	0700	0.90	0.162	0.152	6.19	6.58	20.0	32.0	17.9	42.6	38.3	26.6
900204	1300	0.87	0.123	0.123	8.16	8.16	16.0	16.0	-5.3	61.4	61.6	44.3
900204	1900	0.78	0.132	0.123	7.56	8.16	-48.0	-46.0	-34.3	61.6	49.3	56.2
900204	2200	2.09	0.201	0.181	4.98	5.52	46.0	48.0	41.4	18.2	15.7	12.2
900205	0100	2.24	0.162	0.162	6.19	6.19	42.0	52.0	38.6	26.2	21.5	19.1
900205	0400	2.45	0.318	0.132	3.15	7.56	48.0	48.0	32.9	31.0	25.6	10.8
900205	0700	2.24	0.142	0.123	7.04	8.16	20.0	22.0	30.6	32.2	27.2	30.0
900205	1000	1.94	0.142	0.123	7.04	8.16	20.0	20.0	26.8	33.2	28.3	21.4
900205	1300	1.76	0.132	0.113	7.56	8.87	26.0	20.0	24.9	31.4	28.8	27.0
900205	1900	1.47	0.103	0.103	9.71	9.71	-12.0	14.0	5.9	33.1	29.0	34.7
900206	0100	1.59	0.083	0.083	11.98	11.98	-16.0	4.0	1.0	30.5	28.2	25.2
900206	0700	1.29	0.083	0.083	11.98	11.98	-4.0	4.0	-3.3	30.2	29.5	29.7
900206	1300	1.15	0.083	0.083	11.98	11.98	-10.0	-6.0	-6.5	23.4	23.9	22.1
900206	1900	0.96	0.083	0.083	11.98	11.98	-4.0	-6.0	-9.5	27.6	27.0	28.4
900207	0100	0.82	0.083	0.083	11.98	11.98	-10.0	-10.0	-13.2	25.8	25.0	24.8
900207	0700	0.68	0.074	0.083	13.57	11.98	-12.0	-8.0	-13.6	26.2	24.8	22.3
900207	1300	0.61	0.083	0.083	11.98	11.98	-2.0	-10.0	-12.2	27.6	27.7	26.0
900207	1900	0.51	0.074	0.083	13.57	11.98	-10.0	-10.0	-13.2	38.0	24.5	16.7
900208	0100	0.47	0.083	0.083	11.98	11.98	-14.0	-12.0	-22.6	35.5	26.2	22.2
900208	0700	0.46	0.083	0.083	11.98	11.98	-14.0	-12.0	-12.5	30.9	30.7	24.5
900208	1300	0.45	0.093	0.093	10.72	10.72	10.0	6.0	-9.5	33.1	29.8	28.6
900208	1900	0.51	0.083	0.083	11.98	11.98	-22.0	-10.0	-8.2	33.9	30.3	29.8
900209	0100	0.51	0.083	0.083	11.98	11.98	-16.0	-12.0	-12.0	30.6	30.6	24.8
900209	0700	0.54	0.123	0.123	8.16	8.16	-8.0	-12.0	-12.9	28.6	29.1	24.0
900209	1300	0.56	0.132	0.083	7.56	11.98	-24.0	-18.0	-25.4	31.7	26.2	25.4
900209	1900	0.58	0.074	0.074	13.57	13.57	-12.0	-44.0	-31.0	36.1	20.0	19.3
900210	0100	0.60	0.162	0.103	6.19	9.71	-40.0	-42.0	-33.1	31.4	16.1	10.2
900210	0700	0.78	0.132	0.132	7.56	7.56	-42.0	-46.0	-42.1	23.3	14.0	14.5
900210	1300	0.80	0.279	0.132	3.59	7.56	-52.0	-52.0	-41.9	21.0	11.8	5.4

Table A1 (Continued)

Date	Time EST	H_{m_o} m	$f_{p/o}$ Hz	$f_{p/w}$ Hz	$T_{p/o}$ sec	$T_{p/w}$ sec	$\theta_{p/o}$ deg	$\theta_{p/w}$ deg	$\theta_{o/w}$ deg	$\Delta\theta_{po}$ deg	$\Delta\theta_{pw}$ deg	$\Delta\theta_{ow}$ deg
900210	1900	1.22	0.191	0.181	5.24	5.52	58.0	60.0	36.6	60.4	21.0	19.2
900211	0100	0.86	0.230	0.230	4.35	4.35	56.0	54.0	22.5	63.8	25.2	21.6
900211	0700	1.58	0.171	0.171	5.83	5.83	20.0	26.0	28.6	31.0	26.5	23.8
900211	1300	1.16	0.162	0.152	6.19	6.58	22.0	30.0	23.1	39.6	29.9	21.8
900211	1900	0.95	0.181	0.152	5.52	6.58	28.0	14.0	8.7	45.3	32.6	18.5
900212	0100	0.72	0.123	0.123	8.16	8.16	-34.0	10.0	0.3	43.3	32.0	29.2
900212	0700	0.63	0.123	0.123	8.16	8.16	-30.0	-12.0	-1.0	43.0	31.2	29.6
900212	1900	0.88	0.201	0.201	4.98	4.98	48.0	50.0	40.3	23.0	17.4	13.0
900213	0100	0.49	0.220	0.201	4.54	4.98	44.0	44.0	23.6	37.9	19.2	9.6
900213	0700	0.50	0.123	0.123	8.16	8.16	-14.0	-14.0	7.8	41.6	23.5	21.7
900213	1300	0.52	0.123	0.123	8.16	8.16	-12.0	-12.0	-18.3	39.0	27.7	25.4
900213	1900	0.51	0.318	0.123	3.15	8.16	-56.0	-58.0	-30.0	45.7	19.4	6.4
900214	0100	0.42	0.113	0.113	8.87	8.87	-22.0	-38.0	-34.3	36.8	20.9	26.4
900214	0700	0.36	0.123	0.123	8.16	8.16	-24.0	-24.0	-36.5	30.2	20.6	19.8
900214	1900	0.37	0.093	0.093	10.72	10.72	-14.0	-56.0	-35.0	39.0	17.3	18.1
900215	0100	0.36	0.093	0.093	10.72	10.72	-12.0	-12.0	-23.7	34.8	18.1	15.6
900215	0700	0.37	0.093	0.093	10.72	10.72	-18.0	-16.0	-29.7	30.9	21.2	18.9
900215	1300	0.37	0.083	0.093	11.98	10.72	-16.0	-62.0	-37.9	42.9	23.6	21.8
900215	1900	0.51	0.289	0.093	3.47	10.72	-66.0	-66.0	-45.2	44.2	17.1	6.9
900216	0100	0.65	0.171	0.142	5.83	7.04	-52.0	-54.0	-33.0	55.9	30.3	10.8
900216	0700	0.70	0.132	0.132	7.56	7.56	-40.0	-44.0	-37.5	46.1	36.8	44.3
900216	1300	0.75	0.123	0.132	8.16	7.56	-40.0	-44.0	-45.4	27.8	24.4	42.4
900216	1900	0.71	0.132	0.123	7.56	8.16	-40.0	-58.0	-45.6	24.0	10.6	10.9
900217	0100	0.58	0.113	0.113	8.87	8.87	-38.0	-40.0	-42.5	23.1	15.0	16.9
900217	0700	0.59	0.113	0.103	8.87	9.71	-34.0	-36.0	-40.2	17.8	17.2	12.2
900217	1300	0.47	0.103	0.103	9.71	9.71	-32.0	-38.0	-20.0	35.6	32.5	13.1
900217	1900	1.81	0.181	0.181	5.52	5.52	50.0	50.0	46.3	23.1	21.1	20.0
900218	0100	1.95	0.152	0.142	6.58	7.04	22.0	22.0	28.9	28.8	28.4	25.3
900218	0700	1.44	0.181	0.162	5.52	6.19	30.0	30.0	26.9	37.5	35.0	24.0
900218	1300	1.16	0.142	0.142	7.04	7.04	26.0	36.0	23.8	41.2	35.5	31.0
900218	1900	1.11	0.103	0.152	9.71	6.58	-8.0	-8.0	9.9	44.7	37.0	18.3
900219	0100	0.91	0.181	0.181	5.52	5.52	24.0	-2.0	14.0	43.4	41.4	50.5
900219	0700	0.86	0.162	0.162	6.19	6.19	-38.0	-36.0	-14.9	44.9	44.8	43.5
900219	1300	0.78	0.162	0.152	6.19	6.58	-40.0	-38.0	-19.6	43.3	36.8	21.5
900219	1900	0.72	0.132	0.142	7.56	7.04	-40.0	-40.0	-34.4	34.5	33.9	30.4
900220	0100	0.60	0.142	0.132	7.04	7.56	-42.0	-40.0	-18.2	42.7	23.9	16.9
900220	0700	1.97	0.162	0.162	6.19	6.19	46.0	46.0	40.2	22.8	22.4	21.4
900220	1000	2.09	0.142	0.142	7.04	7.04	38.0	42.0	36.0	26.0	25.0	23.4
900220	1300	1.74	0.142	0.132	7.04	7.56	36.0	44.0	33.9	30.4	28.9	26.9
900220	1900	1.09	0.142	0.132	7.04	7.56	20.0	36.0	25.0	31.3	28.7	24.7
900221	0100	1.06	0.093	0.142	10.72	7.04	-8.0	18.0	14.6	38.4	31.2	12.8
900221	0700	1.02	0.093	0.093	10.72	10.72	-14.0	38.0	16.0	41.1	30.7	16.0
900221	1300	0.95	0.171	0.171	5.83	5.83	14.0	-20.0	1.7	39.4	37.1	38.8
900221	1900	0.86	0.093	0.093	10.72	10.72	-4.0	-4.0	-2.5	31.8	29.4	22.7
900222	0100	0.77	0.103	0.093	9.71	10.72	-6.0	-6.0	-0.2	32.5	33.2	25.4
900222	0700	0.70	0.103	0.103	9.71	9.71	-12.0	-16.0	-27.3	36.0	34.1	22.3
900222	1300	1.12	0.152	0.152	6.58	6.58	-40.0	-52.0	-43.6	22.5	15.6	10.4
900222	1900	1.17	0.123	0.123	8.16	8.16	-38.0	-40.0	-40.7	17.3	15.5	13.2
900223	0100	1.17	0.113	0.113	8.87	8.87	-36.0	-38.0	-38.8	17.8	17.5	14.8
900223	0700	1.14	0.103	0.103	9.71	9.71	-34.0	-38.0	-39.4	19.1	18.2	16.9
900223	1300	1.25	0.093	0.093	10.72	10.72	-34.0	-34.0	-35.3	17.8	16.5	18.3

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PD}$ Hz	$f_{p,PS}$ Hz	$T_{p,PD}$ sec	$T_{p,PS}$ sec	$\theta_{p,PD}$ deg	$\theta_{p,PS}$ deg	$\theta_{p,SW}$ deg	$\Delta\theta_{PD}$ deg	$\Delta\theta_{SW}$ deg	$\Delta\theta_{PSP}$ deg
900223	1900	1.09	0.103	0.103	9.71	9.71	-36.0	-34.0	-38.7	21.8	17.5	20.4
900224	0100	1.05	0.113	0.103	8.87	9.71	-36.0	-36.0	-37.3	20.8	19.3	18.4
900224	0700	0.81	0.093	0.093	10.72	10.72	-32.0	-36.0	-7.3	38.6	20.4	22.9
900224	1300	0.59	0.103	0.103	9.71	9.71	-32.0	-36.0	-23.9	26.6	23.4	16.4
900224	1900	0.57	0.103	0.093	9.71	10.72	-34.0	-40.0	-12.3	40.0	24.5	23.0
900225	0100	0.73	0.201	0.230	4.98	4.35	60.0	72.0	44.5	42.8	11.8	6.0
900225	0700	1.09	0.191	0.191	5.24	5.24	62.0	64.0	53.4	17.4	11.9	10.0
900225	1300	1.04	0.210	0.210	4.75	4.75	60.0	62.0	47.1	28.8	14.8	10.4
900225	1900	1.55	0.152	0.152	6.58	6.58	44.0	60.0	48.9	26.0	16.1	18.8
900226	0100	1.64	0.152	0.152	6.58	6.58	30.0	46.0	38.6	26.7	19.4	20.4
900226	0700	1.55	0.210	0.162	4.75	6.19	50.0	44.0	41.2	28.9	22.3	18.4
900226	1300	1.17	0.162	0.162	6.19	6.19	24.0	24.0	29.7	28.8	25.2	20.9
900226	1900	0.98	0.162	0.162	6.19	6.19	38.0	24.0	27.3	33.2	28.0	20.7
900227	0100	0.78	0.132	0.142	7.56	7.04	14.0	14.0	21.4	38.8	32.5	28.1
900227	0700	0.81	0.113	0.113	8.87	8.87	-2.0	16.0	12.7	37.5	31.5	31.4
900227	1300	0.73	0.103	0.103	9.71	9.71	-2.0	-4.0	2.1	32.4	31.5	30.1
900227	1900	0.76	0.103	0.103	9.71	9.71	-6.0	-8.0	-20.9	38.5	25.7	23.5
900228	0100	0.60	0.093	0.093	10.72	10.72	-32.0	-6.0	-25.1	34.5	31.0	33.0
900228	0700	0.51	0.093	0.093	10.72	10.72	-32.0	-32.0	-15.9	38.6	34.0	33.8
900228	1300	0.74	0.230	0.093	4.35	10.72	42.0	14.0	17.6	47.8	29.2	23.1
900228	1900	0.72	0.103	0.103	9.71	9.71	-22.0	10.0	-2.5	41.8	29.4	26.9
900301	0100	0.57	0.093	0.093	10.72	10.72	-20.0	-18.0	-0.1	44.1	26.2	24.2
900301	0700	1.32	0.220	0.230	4.54	4.35	44.0	48.0	37.5	31.8	24.6	22.0
900301	1300	1.19	0.171	0.171	5.83	5.83	40.0	38.0	30.3	33.6	24.9	20.6
900301	1900	0.82	0.191	0.093	5.24	10.72	42.0	22.0	12.1	51.0	27.1	20.0
900302	0100	0.70	0.093	0.093	10.72	10.72	-24.0	-22.0	2.0	50.6	28.3	20.9
900302	0700	0.71	0.093	0.093	10.72	10.72	-20.0	-20.0	-9.7	37.2	29.1	21.0
900302	1300	0.61	0.093	0.093	10.72	10.72	-22.0	-20.0	-19.4	27.9	28.1	23.4
900302	1900	0.62	0.093	0.093	10.72	10.72	-34.0	-36.0	-31.6	28.3	23.9	27.1
900303	0100	0.68	0.093	0.093	10.72	10.72	-24.0	-38.0	-35.2	29.6	19.9	22.4
900303	0700	0.73	0.132	0.093	7.56	10.72	-38.0	-38.0	-36.7	23.5	18.1	10.6
900303	1300	0.76	0.123	0.093	8.16	10.72	-38.0	-38.0	-36.6	25.8	22.8	13.8
900303	1900	1.07	0.113	0.103	8.87	9.71	-34.0	-36.0	10.2	73.2	26.6	19.3
900304	0100	0.89	0.103	0.103	9.71	9.71	-38.0	-38.0	-8.1	56.6	26.9	24.4
900304	0700	2.30	0.162	0.162	6.19	6.19	50.0	52.0	40.9	26.5	23.0	22.7
900304	1300	1.61	0.162	0.152	6.19	6.58	40.0	46.0	29.7	36.1	25.2	20.6
900304	1900	1.21	0.113	0.132	8.87	7.56	-36.0	16.0	10.1	43.5	31.3	35.1
900305	0100	1.04	0.142	0.113	7.04	8.87	14.0	18.0	12.2	47.6	31.0	33.0
900305	0700	0.94	0.113	0.113	8.87	8.87	-36.0	-36.0	-2.4	43.1	33.8	32.6
900305	1300	0.95	0.113	0.113	8.87	8.87	-16.0	-12.0	3.6	37.5	33.3	23.1
900305	1900	0.82	0.123	0.123	8.16	8.16	-32.0	-12.0	-3.9	37.4	32.5	27.6
900306	0100	0.77	0.074	0.074	13.57	13.57	-16.0	-14.0	-2.8	40.3	34.4	20.8
900306	0700	0.79	0.074	0.074	13.57	13.57	-18.0	-16.0	-23.3	34.7	34.4	22.5
900306	1300	0.79	0.142	0.132	7.04	7.56	-34.0	-10.0	-22.8	33.1	33.3	27.2
900306	1900	1.41	0.308	0.240	3.25	4.17	44.0	28.0	20.0	31.9	25.0	20.7
900306	2200	2.50	0.152	0.152	6.58	6.58	34.0	34.0	31.9	28.6	28.0	26.9
900307	0100	2.96	0.132	0.132	7.56	7.56	38.0	20.0	33.8	32.8	33.1	45.2
900307	0400	2.92	0.132	0.123	7.56	8.16	18.0	50.0	32.1	33.4	31.1	31.7
900307	0700	2.88	0.132	0.132	7.56	7.56	16.0	48.0	27.7	32.8	30.0	28.2
900307	1000	2.71	0.132	0.132	7.56	7.56	22.0	18.0	25.1	32.3	30.2	29.6
900307	1300	2.46	0.123	0.113	8.16	8.87	16.0	20.0	30.5	34.0	30.2	29.1
900307	1900	1.99	0.103	0.103	9.71	9.71	-6.0	12.0	16.3	32.8	29.0	28.1

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,JS}$ Hz	$f_{p,PS}$ Hz	$T_{p,JS}$ sec	$T_{p,PS}$ sec	$\theta_{p,JS}$ deg	$\theta_{p,PS}$ deg	$\theta_{p,SW}$ deg	$\Delta\theta_{JS}$ deg	$\Delta\theta_{PS}$ deg	$\Delta\theta_{SW}$ deg
900307	2200	1.95	0.083	0.083	11.98	11.98	-14.0	14.0	11.3	31.8	30.0	25.4
900308	0100	1.92	0.093	0.093	10.72	10.72	-10.0	12.0	9.1	31.1	29.7	26.1
900308	0400	1.96	0.083	0.093	11.98	10.72	-14.0	-14.0	-1.4	34.6	31.7	26.9
900308	0700	1.87	0.093	0.093	10.72	10.72	-4.0	-2.0	9.7	35.4	31.9	30.6
900308	1300	1.89	0.083	0.093	11.98	10.72	-14.0	-12.0	-9.6	29.7	28.8	24.8
900308	1900	1.60	0.083	0.083	11.98	11.98	-16.0	-14.0	-10.4	26.2	25.3	20.1
900309	0100	1.29	0.074	0.074	13.57	13.57	-10.0	-12.0	-9.5	26.4	26.4	21.6
900309	0700	0.99	0.074	0.074	13.57	13.57	-18.0	-10.0	-8.2	31.3	31.6	29.2
900309	1300	0.88	0.083	0.083	11.98	11.98	-14.0	-12.0	-10.5	25.5	25.7	23.6
900309	1900	0.73	0.083	0.083	11.98	11.98	-10.0	-14.0	-15.3	31.8	30.6	26.3
900310	0100	0.73	0.083	0.083	11.98	11.98	-8.0	-8.0	-18.2	32.6	25.1	25.1
900310	0700	0.72	0.083	0.083	11.98	11.98	-12.0	-12.0	-15.1	29.6	28.6	24.9
900310	1300	0.63	0.083	0.083	11.98	11.98	-20.0	-14.0	-18.4	30.5	31.1	28.0
900310	1900	0.56	0.083	0.083	11.98	11.98	-16.0	-12.0	-13.7	26.5	28.3	25.4
900311	0100	0.64	0.083	0.083	11.98	11.98	-16.0	2.0	-6.4	24.8	22.7	26.1
900311	0700	0.68	0.083	0.083	11.98	11.98	-18.0	-2.0	-7.6	25.9	26.4	25.4
900311	1300	0.71	0.083	0.083	11.98	11.98	-12.0	-14.0	-11.0	22.9	24.7	18.1
900311	1900	0.63	0.083	0.083	11.98	11.98	-16.0	-12.0	-15.8	30.6	29.7	25.7
900312	0100	0.62	0.083	0.083	11.98	11.98	-10.0	-14.0	-18.3	28.1	26.3	22.3
900312	0700	0.58	0.074	0.064	13.57	15.62	-12.0	-16.0	-22.8	27.6	23.7	18.6
900312	1300	0.51	0.074	0.074	13.57	13.57	-12.0	-12.0	-19.2	25.9	24.3	22.2
900312	1900	0.49	0.074	0.074	13.57	13.57	-2.0	-18.0	-18.7	34.3	26.8	27.5
900313	0100	0.43	0.074	0.074	13.57	13.57	-12.0	-16.0	-24.4	27.9	24.6	17.4
900313	0700	0.40	0.074	0.074	13.57	13.57	-12.0	-14.0	-28.6	37.0	23.4	21.3
900313	1300	0.37	0.074	0.074	13.57	13.57	-14.0	-14.0	-26.9	34.6	27.3	19.1
900313	1900	0.35	0.083	0.083	11.98	11.98	-8.0	-16.0	-29.4	34.8	33.8	23.9
900314	0100	0.30	0.083	0.083	11.98	11.98	-18.0	-16.0	-29.4	35.2	31.8	29.4
900314	0700	0.28	0.083	0.083	11.98	11.98	-14.0	-14.0	-22.4	36.5	37.5	26.0
900314	1300	0.29	0.083	0.083	11.98	11.98	-16.0	-14.0	-23.2	34.1	36.3	25.7
900314	1900	0.28	0.093	0.083	10.72	11.98	-24.0	-16.0	-28.0	34.1	31.7	22.7
900315	0100	0.26	0.083	0.083	11.98	11.98	-14.0	-16.0	-27.2	32.6	29.0	27.2
900315	0700	0.27	0.083	0.083	11.98	11.98	-14.0	-36.0	-29.4	31.2	27.9	19.4
900315	1300	0.31	0.318	0.083	3.15	11.98	-68.0	-44.0	-41.2	39.6	22.5	25.4
900315	1900	0.29	0.113	0.093	8.87	10.72	-34.0	-42.0	-35.1	32.2	23.0	18.7
900316	0100	0.30	0.123	0.083	8.16	11.98	-36.0	-54.0	-41.0	39.1	27.0	19.0
900316	0700	0.47	0.201	0.191	4.98	5.24	-52.0	-52.0	-47.8	25.5	17.4	10.3
900316	1300	0.46	0.162	0.181	6.19	5.52	-44.0	-44.0	-44.7	17.5	13.2	6.2
900316	1900	0.48	0.152	0.171	6.58	5.83	-44.0	-44.0	-45.2	16.4	11.9	6.5
900317	0100	0.52	0.162	0.142	6.19	7.04	-44.0	-44.0	-43.3	14.8	12.2	7.3
900317	0700	0.60	0.142	0.132	7.04	7.56	-38.0	-38.0	-41.4	12.9	11.5	5.7
900317	1300	0.99	0.240	0.240	4.17	4.17	-54.0	-54.0	-48.8	16.1	7.0	4.0
900317	1900	0.75	0.142	0.123	7.04	8.16	-36.0	-40.0	-43.6	15.5	9.5	7.1
900318	0100	0.84	0.132	0.123	7.56	8.16	-38.0	-40.0	-45.6	20.2	34.1	8.6
900318	0700	1.07	0.191	0.191	5.24	5.24	34.0	38.0	22.5	61.8	24.6	17.7
900318	1300	0.76	0.093	0.191	10.72	5.24	-34.0	-34.0	5.0	59.3	28.3	18.4
900318	1900	0.54	0.113	0.113	8.87	8.87	-36.0	-36.0	-18.4	40.6	25.6	17.0
900319	0100	0.58	0.123	0.123	8.16	8.16	-38.0	-38.0	-31.5	34.7	34.2	26.2
900319	0700	0.61	0.123	0.123	8.16	8.16	-32.0	-32.0	-28.8	26.8	25.0	16.4
900319	1300	0.51	0.123	0.123	8.16	8.16	-38.0	-38.0	-33.4	29.2	27.5	19.7
900319	1900	0.73	0.191	0.191	5.24	5.24	-44.0	-42.0	-42.3	36.8	51.8	19.3
900320	0100	0.95	0.181	0.181	5.52	5.52	-46.0	-40.0	-19.3	39.1	40.1	27.4

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,PP}$ Hz	$T_{p,PM}$ sec	$T_{p,PP}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,PP}$ deg	$\theta_{p,mm}$ deg	$\Delta\theta_{pp}$ deg	$\Delta\theta_{mm}$ deg	$\Delta\theta_{mp}$ deg
900320	0700	1.40	0.201	0.191	4.98	5.24	50.0	52.0	42.9	16.7	15.5	10.1
900320	1300	1.23	0.181	0.181	5.52	5.52	44.0	46.0	35.7	29.8	19.5	12.1
900320	1900	1.00	0.162	0.171	6.19	5.83	38.0	40.0	33.1	27.4	17.1	13.6
900321	0100	0.94	0.191	0.162	5.24	6.19	46.0	58.0	38.6	32.8	13.6	10.9
900321	0700	0.70	0.289	0.171	3.47	5.83	58.0	58.0	35.8	38.8	14.3	7.8
900321	1300	0.73	0.201	0.191	4.98	5.24	48.0	48.0	42.3	27.2	14.6	7.9
900322	0400	0.35	0.083	0.074	11.98	13.57	-12.0	-12.0	11.7	41.6	31.6	16.9
900322	1300	0.37	0.113	0.113	8.87	8.87	-12.0	-14.0	-12.6	33.1	32.1	15.8
900322	1900	0.34	0.123	0.113	8.16	8.87	-12.0	-12.0	-14.2	26.1	27.6	25.2
900323	0100	0.35	0.123	0.123	8.16	8.16	-20.0	-18.0	-27.7	34.9	26.6	22.2
900323	0700	0.31	0.123	0.123	8.16	8.16	-36.0	-36.0	-33.0	30.0	26.2	18.6
900323	1900	0.32	0.123	0.123	8.16	8.16	-36.0	-38.0	-36.0	31.8	26.3	23.0
900324	0100	1.77	0.171	0.171	5.83	5.83	46.0	46.0	37.7	26.3	25.5	24.3
900324	0700	1.89	0.162	0.162	6.19	6.19	16.0	18.0	28.0	32.8	31.4	27.6
900324	1000	1.94	0.142	0.142	7.04	7.04	18.0	16.0	17.6	31.3	29.5	26.3
900324	1300	1.96	0.142	0.142	7.04	7.04	16.0	16.0	20.2	33.4	29.4	27.9
900324	1900	2.05	0.152	0.142	6.58	7.04	40.0	16.0	24.3	33.3	29.4	28.6
900324	2200	1.95	0.132	0.132	7.56	7.56	24.0	14.0	21.6	29.5	27.9	30.3
900325	0100	1.67	0.123	0.132	8.16	7.56	-2.0	14.0	13.0	31.5	29.3	27.2
900325	0700	1.32	0.318	0.142	3.15	7.04	44.0	16.0	22.2	32.7	26.8	18.6
900325	1300	1.30	0.113	0.113	8.87	8.87	0.0	12.0	14.8	31.6	26.4	24.3
900325	1900	1.05	0.171	0.171	5.83	5.83	12.0	6.0	13.6	31.1	27.1	21.2
900326	0100	0.82	0.113	0.113	8.87	8.87	-2.0	8.0	11.0	27.2	24.6	27.6
900326	0700	0.61	0.113	0.113	8.87	8.87	0.0	8.0	10.5	30.8	26.9	23.6
900326	1300	0.71	0.113	0.113	8.87	8.87	-10.0	8.0	14.1	38.4	24.9	25.5
900326	1900	0.61	0.113	0.123	8.87	8.16	8.0	-4.0	15.1	37.0	30.0	32.7
900327	0100	0.52	0.123	0.123	8.16	8.16	0.0	-6.0	4.9	32.4	30.8	30.4
900327	0700	1.12	0.289	0.240	3.47	4.17	52.0	50.0	33.4	30.9	21.9	17.3
900327	1900	1.26	0.152	0.152	6.58	6.58	40.0	22.0	24.1	32.5	28.3	26.8
900328	0100	1.17	0.132	0.152	7.56	6.58	-12.0	12.0	16.2	38.3	31.2	20.6
900328	0700	1.11	0.210	0.210	4.75	4.75	36.0	14.0	12.7	36.3	32.6	37.3
900328	1300	0.86	0.132	0.132	7.56	7.56	-12.0	12.0	8.6	36.3	29.6	23.0
900328	1900	0.78	0.132	0.103	7.56	9.71	0.0	2.0	5.3	37.6	34.8	27.3
900329	0100	0.80	0.259	0.259	3.86	3.86	6.0	6.0	0.2	37.2	32.6	33.7
900329	0700	1.26	0.201	0.201	4.98	4.98	-14.0	2.0	-8.7	29.7	29.3	24.4
900329	1300	1.60	0.191	0.191	5.24	5.24	18.0	18.0	11.6	36.6	32.1	28.9
900329	1600	2.31	0.171	0.152	5.83	6.58	14.0	12.0	12.3	36.5	35.3	26.1
900329	1900	2.49	0.142	0.142	7.04	7.04	20.0	10.0	14.9	38.2	37.9	42.9
900329	2200	2.09	0.132	0.132	7.56	7.56	-38.0	8.0	-12.2	49.5	43.4	42.1
900330	0100	2.06	0.123	0.123	8.16	8.16	-40.0	-38.0	-10.1	45.2	40.6	34.3
900330	0400	1.99	0.113	0.113	8.87	8.87	-34.0	-36.0	-27.2	36.2	34.7	29.4
900330	0700	1.60	0.113	0.113	8.87	8.87	-40.0	-40.0	-28.0	43.9	40.4	35.1
900330	1300	1.46	0.113	0.103	8.87	9.71	-42.0	-42.0	-24.3	46.4	44.4	43.6
900330	1900	1.60	0.103	0.103	9.71	9.71	-16.0	-12.0	-21.9	44.4	42.9	38.1
900331	0100	1.28	0.123	0.113	8.16	8.87	-38.0	-38.0	-3.6	48.9	46.0	45.3
900331	0700	1.14	0.123	0.123	8.16	8.16	-40.0	-40.0	-2.8	48.0	47.4	40.8
900331	1300	1.00	0.123	0.123	8.16	8.16	-42.0	-42.0	-16.2	49.7	43.7	45.3
900331	1900	0.99	0.113	0.113	8.87	8.87	-8.0	-34.0	-7.6	48.2	45.7	28.1
900401	0100	0.84	0.123	0.123	8.16	8.16	-28.0	-36.0	-26.4	48.1	46.2	36.5
900401	0700	0.85	0.132	0.132	7.56	7.56	-32.0	-34.0	-12.6	56.6	38.5	29.8
900401	1300	0.74	0.132	0.123	7.56	8.16	-36.0	16.0	-4.9	55.1	35.2	36.3
900401	1900	0.69	0.142	0.132	7.04	7.56	-34.0	-36.0	-8.2	49.6	34.1	26.4

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,avg}$ Hz	$f_{p,spec}$ Hz	$T_{p,avg}$ sec	$T_{p,spec}$ sec	$\theta_{p,avg}$ deg	$\theta_{p,spec}$ deg	$\theta_{p,mm}$ deg	$\Delta\theta_{mo}$ deg	$\Delta\theta_{mm}$ deg	$\Delta\theta_{mm}$ deg
900402	0100	0.68	0.132	0.132	7.56	7.56	-4.0	12.0	-2.0	44.0	37.3	36.6
900402	0700	0.70	0.142	0.142	7.04	7.04	10.0	12.0	-1.1	38.0	35.1	42.4
900402	1300	0.69	0.132	0.132	7.56	7.56	8.0	14.0	8.2	37.6	36.1	40.3
900402	1900	0.67	0.123	0.123	8.16	8.16	-8.0	4.0	-10.1	41.8	37.3	28.4
900403	1300	1.19	0.064	0.064	15.62	15.62	0.0	52.0	17.7	54.1	23.9	25.3
900404	0100	1.03	0.064	0.074	15.62	13.57	-8.0	18.0	11.4	37.4	22.7	24.3
900404	0700	0.86	0.074	0.074	13.57	13.57	-10.0	-10.0	2.4	31.7	23.2	22.5
900404	1300	0.74	0.074	0.074	13.57	13.57	-12.0	-6.0	-1.5	28.4	27.1	24.0
900404	1900	0.65	0.074	0.074	13.57	13.57	-14.0	-14.0	-18.4	26.8	28.9	22.5
900405	0100	0.56	0.083	0.083	11.98	11.98	-14.0	-16.0	-23.2	38.6	23.9	26.3
900405	0700	0.47	0.083	0.083	11.98	11.98	-14.0	-12.0	-23.7	36.7	21.5	22.8
900405	1300	0.48	0.083	0.083	11.98	11.98	-16.0	-16.0	-24.7	41.4	21.3	23.2
900405	1900	0.47	0.083	0.083	11.98	11.98	-12.0	-10.0	-23.1	38.4	24.7	26.2
900406	0100	0.48	0.083	0.083	11.98	11.98	-10.0	-4.0	-15.7	32.0	26.2	25.8
900406	0700	0.52	0.083	0.083	11.98	11.98	-10.0	-10.0	-16.0	32.5	28.1	27.4
900406	1900	1.27	0.191	0.191	5.24	5.24	36.0	48.0	33.9	23.7	20.1	12.7
900407	0100	1.21	0.181	0.171	5.52	5.83	24.0	22.0	14.0	31.8	27.5	14.3
900407	0700	1.52	0.162	0.162	6.19	6.19	32.0	44.0	29.6	24.8	20.2	16.7
900407	1900	1.11	0.132	0.132	7.56	7.56	10.0	20.0	21.0	28.1	25.6	27.3
900408	0100	1.13	0.123	0.113	8.16	8.87	24.0	22.0	17.2	28.5	26.1	28.7
900408	0700	1.05	0.113	0.113	8.87	8.87	8.0	16.0	17.0	29.7	23.6	26.4
900408	1300	0.87	0.132	0.132	7.56	7.56	14.0	14.0	20.6	31.3	25.2	29.3
900408	1900	0.65	0.123	0.103	8.16	9.71	12.0	16.0	11.0	39.4	26.9	29.2
900409	0100	0.56	0.123	0.113	8.16	8.87	-14.0	-14.0	-11.3	29.5	28.4	22.1
900409	0700	0.57	0.123	0.113	8.16	8.87	-16.0	-16.0	-16.4	22.9	23.7	19.2
900409	1300	0.48	0.113	0.123	8.87	8.16	-12.0	-14.0	-13.8	22.7	23.7	17.7
900409	1900	0.45	0.132	0.123	7.56	8.16	-14.0	-14.0	-21.7	27.6	24.5	17.1
900410	0100	0.45	0.132	0.132	7.56	7.56	-10.0	-8.0	-16.0	28.6	25.0	22.1
900410	0700	0.50	0.230	0.083	4.35	11.98	-52.0	-16.0	-32.3	34.1	25.2	25.7
900410	1900	0.61	0.181	0.181	5.52	5.52	-44.0	-46.0	-40.4	27.5	17.0	21.4
900411	0100	0.74	0.142	0.142	7.04	7.04	-36.0	-36.0	-39.4	14.3	9.5	6.3
900411	1300	0.77	0.123	0.123	8.16	8.16	-38.0	-38.0	-39.1	18.2	16.5	12.8
900411	1900	0.82	0.113	0.113	8.87	8.87	-38.0	-38.0	-26.9	27.7	22.7	16.1
900412	0100	1.10	0.171	0.171	5.83	5.83	44.0	44.0	30.4	45.7	20.8	11.0
900412	0700	0.77	0.113	0.113	8.87	8.87	-38.0	-38.0	3.3	77.6	23.5	18.3
900412	1300	0.66	0.123	0.113	8.16	8.87	-34.0	-34.0	-11.7	41.2	28.7	19.6
900412	1900	0.71	0.123	0.123	8.16	8.16	-32.0	-32.0	-11.5	44.7	30.2	21.0
900413	0100	0.83	0.113	0.113	8.87	8.87	-38.0	38.0	-1.7	51.6	27.7	26.0
900413	0700	1.22	0.191	0.201	5.24	4.98	44.0	42.0	20.4	42.9	27.3	29.9
900413	1300	0.86	0.191	0.123	5.24	8.16	38.0	38.0	5.4	46.9	31.7	29.9
900413	1900	0.82	0.123	0.123	8.16	8.16	-12.0	-10.0	-4.1	36.1	31.1	24.1
900414	0100	0.78	0.103	0.123	9.71	8.16	-16.0	-14.0	-4.3	35.9	29.0	26.5
900414	0700	0.78	0.103	0.103	9.71	9.71	-16.0	-16.0	-5.1	42.1	33.9	28.9
900414	1300	0.72	0.103	0.113	9.71	8.87	-12.0	-34.0	-9.7	40.8	41.8	27.0
900414	1900	0.73	0.123	0.113	8.16	8.87	-36.0	-40.0	-33.2	39.7	39.4	37.4
900415	0100	1.11	0.162	0.162	6.19	6.19	-46.0	-44.0	-39.6	30.0	25.5	22.2
900415	0700	1.19	0.152	0.142	6.58	7.04	-42.0	-42.0	-37.9	31.5	29.8	28.6
900415	1300	1.22	0.132	0.132	7.56	7.56	-38.0	-38.0	-36.8	30.2	28.6	23.6
900415	1900	1.09	0.132	0.132	7.56	7.56	-40.0	-40.0	-38.0	31.7	30.6	27.8
900416	0100	0.84	0.132	0.132	7.56	7.56	-28.0	-30.0	-36.4	31.6	29.6	20.9

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,JS}$ Hz	$f_{p,PM}$ Hz	$T_{p,JS}$ sec	$T_{p,PM}$ sec	$\theta_{p,JS}$ deg	$\theta_{p,PM}$ deg	$\theta_{p,mm}$ deg	$\Delta\theta_{pp}$ deg	$\Delta\theta_{mm}$ deg	$\Delta\theta_{mp}$ deg
900416	0700	0.73	0.142	0.123	7.04	8.16	-30.0	-36.0	-29.2	33.4	30.0	22.0
900416	1300	0.68	0.142	0.113	7.04	8.87	-40.0	-40.0	-26.2	38.4	29.0	21.6
900416	1900	0.77	0.113	0.113	8.87	8.87	-34.0	-38.0	-25.4	33.2	28.5	29.9
900417	0100	0.79	0.123	0.113	8.16	8.87	-36.0	-34.0	-24.7	32.4	31.0	28.8
900417	0700	0.80	0.103	0.103	9.71	9.71	-16.0	-16.0	-27.0	32.0	30.1	24.4
900417	1300	0.76	0.103	0.103	9.71	9.71	-22.0	-22.0	-33.0	35.2	32.4	32.1
900417	1900	1.48	0.230	0.210	4.35	4.75	54.0	54.0	43.5	20.3	16.8	9.8
900417	2200	2.09	0.152	0.152	6.58	6.58	42.0	48.0	44.0	19.9	19.2	17.0
900418	0100	1.94	0.171	0.152	5.83	6.58	44.0	50.0	40.7	24.9	21.2	14.9
900418	0400	2.05	0.152	0.152	6.58	6.58	38.0	42.0	41.4	25.8	21.8	21.3
900418	0700	2.17	0.152	0.142	6.58	7.04	24.0	26.0	31.2	29.9	25.3	23.2
900418	1900	1.08	0.103	0.113	9.71	8.87	-12.0	12.0	2.9	38.5	31.9	29.2
900419	0100	0.98	0.113	0.113	8.87	8.87	-12.0	-10.0	2.7	38.4	35.7	30.2
900419	0700	1.07	0.113	0.113	8.87	8.87	-30.0	8.0	1.4	43.4	39.1	31.7
900419	1300	1.42	0.123	0.123	8.16	8.16	0.0	2.0	2.8	37.0	30.6	30.3
900419	1900	1.27	0.162	0.132	6.19	7.56	-2.0	-2.0	-5.3	32.1	29.7	27.6
900420	0100	1.02	0.142	0.132	7.04	7.56	-34.0	0.0	-9.2	35.5	32.7	30.6
900420	0700	0.85	0.132	0.132	7.56	7.56	-32.0	4.0	-11.3	34.7	34.0	29.2
900420	1300	0.85	0.142	0.113	7.04	8.87	-32.0	-34.0	-26.7	34.8	35.5	27.4
900420	1900	0.73	0.142	0.103	7.04	9.71	-30.0	-30.0	-23.5	31.1	30.7	21.3
900421	0100	0.69	0.103	0.103	9.71	9.71	-16.0	-20.0	-25.0	30.4	26.9	23.7
900421	0700	0.60	0.103	0.103	9.71	9.71	-10.0	-18.0	-24.8	28.1	25.1	26.0
900421	1300	0.62	0.103	0.103	9.71	9.71	-22.0	-24.0	-30.3	30.6	23.8	26.8
900421	1900	0.56	0.103	0.103	9.71	9.71	-36.0	-36.0	-31.2	28.8	22.7	28.7
900422	0100	0.55	0.103	0.103	9.71	9.71	-36.0	-26.0	-29.7	31.1	28.8	28.6
900422	0700	0.89	0.240	0.250	4.17	4.01	40.0	-20.0	21.3	68.0	29.0	25.5
900422	1300	1.17	0.093	0.093	10.72	10.72	-14.0	-8.0	8.8	36.5	28.5	27.6
900422	1900	1.17	0.093	0.093	10.72	10.72	-18.0	12.0	3.7	36.9	30.0	34.9
900423	0100	1.33	0.103	0.103	9.71	9.71	-14.0	-14.0	-1.0	31.4	28.9	27.3
900423	0700	1.06	0.093	0.103	10.72	9.71	-10.0	-8.0	-2.9	30.1	27.5	28.6
900423	1300	0.97	0.093	0.093	10.72	10.72	-14.0	-14.0	-6.9	30.0	28.7	28.3
900423	1900	0.84	0.093	0.093	10.72	10.72	-14.0	-14.0	-11.6	26.8	27.3	29.7
900424	0100	0.72	0.093	0.093	10.72	10.72	-16.0	-16.0	-14.6	27.0	26.9	26.5
900424	0700	0.69	0.093	0.093	10.72	10.72	-14.0	-16.0	-12.0	31.0	29.5	27.2
900424	1300	0.68	0.093	0.103	10.72	9.71	-14.0	-14.0	-17.9	32.4	32.2	25.0
900424	1900	0.59	0.093	0.093	10.72	10.72	-8.0	-10.0	-13.3	32.8	32.0	24.0
900425	0100	0.54	0.093	0.093	10.72	10.72	-20.0	-18.0	-14.4	29.4	29.2	26.6
900425	0700	0.58	0.093	0.093	10.72	10.72	-6.0	26.0	4.4	40.0	26.9	27.8
900425	1300	0.80	0.103	0.103	9.71	9.71	-16.0	14.0	13.5	40.7	24.0	27.1
900425	1900	0.76	0.093	0.093	10.72	10.72	-12.0	16.0	4.3	32.9	27.3	25.9
900426	0100	0.76	0.103	0.103	9.71	9.71	-24.0	-6.0	-3.4	34.0	29.8	31.2
900426	0700	0.75	0.103	0.103	9.71	9.71	-14.0	14.0	-5.3	34.2	33.5	33.1
900426	1300	0.74	0.103	0.103	9.71	9.71	-6.0	-6.0	-0.5	30.9	31.5	28.7
900426	1900	0.72	0.093	0.093	10.72	10.72	-2.0	-2.0	2.0	34.8	35.8	28.3
900427	0100	0.76	0.093	0.093	10.72	10.72	-18.0	-2.0	-5.1	30.4	30.4	30.6
900427	0700	0.78	0.103	0.093	9.71	10.72	-6.0	-4.0	-3.2	30.6	30.8	27.4
900427	1300	0.71	0.103	0.093	9.71	10.72	-8.0	-8.0	-6.7	28.5	28.5	26.1
900427	1900	0.65	0.093	0.103	10.72	9.71	-14.0	14.0	-1.4	31.2	31.0	25.8
900428	0100	0.61	0.103	0.103	9.71	9.71	-18.0	-16.0	-3.3	30.1	29.5	26.1
900428	0700	0.60	0.103	0.103	9.71	9.71	8.0	-4.0	2.4	27.9	28.3	25.0
900428	1300	0.50	0.103	0.103	9.71	9.71	-12.0	-12.0	-6.5	29.0	25.7	20.9
900428	1900	0.46	0.113	0.103	8.87	9.71	-14.0	-14.0	-14.2	30.3	27.9	27.5

Table A1 (Continued)

Date	Time EST	N_{max} m	$f_{o,PD}$ Hz	$f_{o,PS}$ Hz	$T_{o,PD}$ sec	$T_{o,PS}$ sec	$\theta_{o,PD}$ deg	$\theta_{o,PS}$ deg	$\theta_{o,SW}$ deg	$\Delta\theta_{PS}$ deg	$\Delta\theta_{SW}$ deg	$\Delta\theta_{PSP}$ deg
900429	0100	0.45	0.093	0.083	10.72	11.98	-8.0	-8.0	-14.4	31.2	31.3	23.8
900429	0700	0.48	0.093	0.093	10.72	10.72	-18.0	-22.0	-26.7	33.4	29.1	24.3
900429	1300	0.47	0.064	0.093	15.62	10.72	-10.0	-24.0	-23.0	31.4	28.2	17.9
900429	1900	0.72	0.171	0.171	5.83	5.83	-48.0	-46.0	-40.7	29.2	22.3	19.4
900430	0100	0.63	0.171	0.162	5.83	6.19	-54.0	-48.0	-42.4	38.0	27.6	19.5
900430	0700	0.68	0.162	0.162	6.19	6.19	28.0	30.0	-11.5	57.2	49.9	65.9
900430	1300	0.66	0.162	0.162	6.19	6.19	-44.0	-44.0	0.2	62.4	52.9	62.3
900430	1900	0.77	0.171	0.152	5.83	6.58	-44.0	-40.0	-25.3	50.0	45.8	60.5
900501	0100	0.74	0.142	0.113	7.04	8.87	-44.0	-44.0	-28.1	54.8	49.7	45.6
900501	0700	0.66	0.123	0.123	8.16	8.16	10.0	10.0	-8.5	45.4	47.4	38.2
900501	1300	0.72	0.123	0.123	8.16	8.16	-34.0	10.0	-17.5	43.5	43.6	39.0
900501	1900	0.67	0.123	0.123	8.16	8.16	-36.0	-38.0	-29.9	39.9	38.4	32.6
900502	0100	0.63	0.074	0.074	13.57	13.57	-16.0	-16.0	-24.7	34.8	34.7	23.5
900502	0700	0.73	0.074	0.074	13.57	13.57	-12.0	-14.0	-13.8	31.1	30.9	24.1
900502	1900	0.91	0.083	0.074	11.98	13.57	-8.0	-8.0	3.2	37.0	29.0	19.3
900503	0100	0.84	0.074	0.074	13.57	13.57	-16.0	-12.0	-4.0	32.6	31.6	26.0
900503	1300	1.01	0.074	0.230	13.57	4.35	-10.0	6.0	6.9	35.6	32.0	23.6
900503	1900	0.97	0.220	0.220	4.54	4.54	2.0	2.0	8.3	36.3	31.0	30.1
900504	0100	0.85	0.191	0.201	5.24	4.98	14.0	0.0	2.9	33.4	29.3	20.4
900504	0700	0.78	0.074	0.083	13.57	11.98	-16.0	-14.0	-14.1	39.2	40.4	21.5
900504	1300	0.75	0.074	0.210	13.57	4.75	-18.0	-14.0	-28.1	43.2	40.8	24.7
900504	1900	0.65	0.083	0.083	11.98	11.98	-18.0	-46.0	-36.3	44.0	26.8	24.1
900505	0100	0.56	0.083	0.083	11.98	11.98	-12.0	-56.0	-33.4	41.0	22.1	20.9
900505	0700	0.50	0.162	0.083	6.19	11.98	-42.0	-42.0	-36.7	34.6	19.2	13.3
900505	1300	0.48	0.142	0.083	7.04	11.98	-42.0	-42.0	-38.4	32.2	18.4	9.3
900506	0100	0.38	0.132	0.132	7.56	7.56	-40.0	-40.0	-27.3	32.1	26.6	7.0
900506	0700	1.25	0.171	0.171	5.83	5.83	42.0	40.0	39.3	17.9	17.2	12.1
900506	1300	0.89	0.171	0.171	5.83	5.83	42.0	42.0	36.4	28.2	25.4	15.9
900506	1900	0.59	0.181	0.181	5.52	5.52	36.0	36.0	18.4	49.4	30.3	17.6
900507	0100	0.54	0.093	0.093	10.72	10.72	-12.0	32.0	1.3	47.1	31.2	28.2
900507	0700	0.57	0.162	0.132	6.19	7.56	18.0	20.0	11.2	43.5	32.6	35.6
900507	1300	0.55	0.162	0.162	6.19	6.19	16.0	16.0	11.0	42.9	30.4	17.5
900507	1900	0.41	0.093	0.093	10.72	10.72	-2.0	-2.0	-8.3	38.3	34.5	30.0
900508	0100	0.41	0.152	0.103	6.58	9.71	-14.0	-14.0	-8.1	27.6	29.3	18.8
900508	0700	0.33	0.093	0.093	10.72	10.72	-6.0	-12.0	-11.6	31.4	31.3	26.3
900508	1300	0.30	0.103	0.103	9.71	9.71	10.0	-8.0	-15.6	32.0	29.0	32.3
900508	1900	0.43	0.259	0.298	3.86	3.35	-64.0	-64.0	-50.0	34.6	15.4	6.0
900509	0100	0.27	0.103	0.103	9.71	9.71	-6.0	-12.0	-18.4	37.7	30.4	32.1
900509	0700	0.27	0.093	0.093	10.72	10.72	6.0	-32.0	-20.7	41.0	31.5	34.9
900509	1300	0.26	0.103	0.103	9.71	9.71	-6.0	-54.0	-28.2	42.9	27.1	33.6
900509	1900	0.33	0.308	0.318	3.25	3.15	-56.0	-56.0	-42.3	38.8	15.2	4.3
900510	0100	0.30	0.318	0.103	3.15	9.71	-54.0	-52.0	-39.2	30.9	17.2	8.5
900510	0700	0.55	0.152	0.142	6.58	7.04	-42.0	-44.0	-45.9	16.8	12.2	5.4
900510	1300	1.07	0.132	0.132	7.56	7.56	-38.0	-48.0	-44.5	12.8	7.3	6.1
900510	1900	0.97	0.123	0.113	8.16	8.87	-38.0	-38.0	-41.2	11.7	9.4	7.4
900511	0100	0.56	0.123	0.113	8.16	8.87	-36.0	-38.0	-29.7	23.6	18.4	16.5
900511	0700	0.47	0.113	0.113	8.87	8.87	-36.0	-36.0	-18.9	35.4	22.1	12.7
900511	1300	0.46	0.113	0.113	8.87	8.87	-26.0	-40.0	-23.9	30.0	23.4	17.5
900511	1900	0.53	0.132	0.132	7.56	7.56	-38.0	-40.0	-30.0	30.7	21.2	9.1
900512	0100	0.52	0.113	0.113	8.87	8.87	-32.0	-40.0	-27.1	34.4	26.1	22.5
900512	0700	0.57	0.123	0.123	8.16	8.16	-40.0	-38.0	-29.5	32.6	26.3	18.7

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,avg}$ Hz	$f_{p,pk}$ Hz	$T_{p,avg}$ sec	$T_{p,pk}$ sec	$\theta_{p,avg}$ deg	$\theta_{p,pk}$ deg	$\theta_{p,dir}$ deg	$\Delta\theta_{pc}$ deg	$\Delta\theta_{pw}$ deg	$\Delta\theta_{mw}$ deg
900512	1300	0.94	0.123	0.123	8.16	8.16	-42.0	-40.0	5.2	59.0	27.9	18.8
900512	1900	0.89	0.123	0.123	8.16	8.16	-30.0	-28.0	-5.2	56.1	35.2	19.2
900513	0100	0.86	0.181	0.181	5.52	5.52	-46.0	-48.0	-41.3	48.7	44.0	61.7
900513	0700	0.98	0.162	0.171	6.19	5.83	-42.0	-44.0	-39.7	33.1	30.7	20.1
900513	1300	0.90	0.162	0.152	6.19	6.58	-42.0	-42.0	-39.7	25.3	17.9	13.8
900513	1900	0.95	0.162	0.152	6.19	6.58	-42.0	-42.0	-40.8	20.4	15.7	10.8
900514	0100	0.73	0.132	0.132	7.56	7.56	-36.0	-38.0	-37.4	22.3	19.4	18.2
900514	0700	0.66	0.152	0.152	6.58	6.58	-40.0	-42.0	-6.8	73.6	25.8	13.7
900514	1300	0.75	0.210	0.210	4.75	4.75	50.0	48.0	15.1	74.5	25.2	17.5
900514	1900	0.69	0.152	0.132	6.58	7.56	-36.0	-30.0	-5.7	60.2	31.7	14.0
900515	0100	0.65	0.132	0.123	7.56	8.16	-26.0	-30.0	3.0	61.5	33.1	14.3
900515	0700	0.67	0.123	0.123	8.16	8.16	-36.0	-36.0	2.5	65.1	30.9	27.0
900515	1300	0.64	0.201	0.113	4.98	8.87	38.0	38.0	-0.3	51.5	28.6	22.1
900515	1900	0.67	0.171	0.123	5.83	8.16	10.0	8.0	-6.2	39.1	30.1	38.7
900516	0100	0.59	0.064	0.113	15.62	8.87	-10.0	-8.0	-8.3	36.4	32.3	19.3
900516	0700	0.61	0.074	0.074	13.57	13.57	-6.0	-6.0	-10.7	33.0	31.9	24.1
900516	1300	0.58	0.074	0.074	13.57	13.57	-12.0	6.0	-9.9	33.7	28.9	21.7
900516	1900	0.60	0.298	0.074	3.35	13.57	-56.0	-56.0	-28.5	40.3	23.4	4.5
900517	0100	0.50	0.074	0.074	13.57	13.57	-6.0	-38.0	-28.2	33.3	23.2	18.8
900517	0700	0.45	0.083	0.083	11.98	11.98	-14.0	-16.0	-27.7	34.0	25.0	23.5
900517	1300	0.41	0.083	0.083	11.98	11.98	-12.0	-52.0	-29.4	41.3	22.3	24.5
900517	1900	0.48	0.142	0.093	7.04	10.72	-42.0	-44.0	-28.5	47.4	19.5	9.8
900518	0100	0.44	0.142	0.083	7.04	11.98	-44.0	-44.0	-23.5	47.7	23.6	7.7
900518	0700	0.42	0.093	0.093	10.72	10.72	0.0	2.0	-3.0	42.1	29.3	20.1
900518	1300	0.38	0.093	0.093	10.72	10.72	-8.0	-10.0	-8.9	34.9	33.0	30.0
900518	1900	0.38	0.093	0.093	10.72	10.72	-14.0	-14.0	-11.2	30.1	30.7	23.2
900519	0100	0.32	0.093	0.093	10.72	10.72	-4.0	0.0	-15.2	34.6	31.5	24.8
900519	0700	0.28	0.103	0.093	9.71	10.72	10.0	6.0	-10.8	37.0	37.9	25.8
900519	1300	0.30	0.093	0.103	10.72	9.71	-12.0	12.0	-3.8	40.8	39.8	31.5
900519	1900	0.29	0.103	0.103	9.71	9.71	-10.0	10.0	-19.5	44.9	38.7	24.3
900520	0100	0.31	0.318	0.318	3.15	3.15	-70.0	-70.0	-38.9	62.7	29.2	34.3
900520	0700	0.28	0.103	0.103	9.71	9.71	18.0	16.0	-8.9	48.4	25.9	23.4
900520	1300	0.40	0.103	0.103	9.71	9.71	-2.0	-2.0	-12.4	39.4	27.6	24.0
900520	1900	0.46	0.279	0.103	3.59	9.71	-64.0	-64.0	-33.0	62.4	16.4	5.7
900521	0100	0.52	0.171	0.103	5.83	9.71	-48.0	-48.0	-24.1	51.9	19.0	6.1
900521	0700	0.51	0.152	0.083	6.58	11.98	-46.0	-2.0	-15.9	50.1	24.6	5.8
900521	1300	0.55	0.083	0.083	11.98	11.98	-8.0	0.0	-0.7	51.8	40.4	24.2
900521	1900	1.00	0.230	0.230	4.35	4.35	46.0	28.0	29.0	32.0	27.7	22.5
900522	0100	1.79	0.191	0.152	5.24	6.58	24.0	22.0	28.2	26.2	25.7	18.0
900522	0700	1.82	0.171	0.171	5.83	5.83	12.0	20.0	24.8	26.7	26.6	21.8
900522	1000	1.91	0.171	0.171	5.83	5.83	18.0	18.0	19.8	26.9	26.4	21.4
900522	1300	2.27	0.171	0.162	5.83	6.19	14.0	18.0	23.8	28.8	28.4	23.7
900522	1600	2.34	0.152	0.152	6.58	6.58	18.0	18.0	22.9	30.3	29.6	31.3
900522	1900	2.58	0.152	0.142	6.58	7.04	18.0	18.0	19.6	32.4	30.1	29.2
900522	2200	2.61	0.142	0.142	7.04	7.04	16.0	16.0	15.6	30.7	29.7	28.4
900523	0100	2.19	0.142	0.142	7.04	7.04	8.0	10.0	17.3	31.9	30.1	30.5
900523	0700	1.69	0.132	0.132	7.56	7.56	14.0	16.0	13.1	32.0	29.5	28.7
900523	1300	1.31	0.152	0.123	6.58	8.16	6.0	4.0	-1.9	30.7	28.9	30.3
900523	1900	1.05	0.113	0.113	8.87	8.87	-14.0	-14.0	0.4	31.9	29.5	26.1
900524	0100	0.81	0.113	0.113	8.87	8.87	-14.0	-12.0	-1.4	29.4	28.9	21.6
900524	0700	0.65	0.093	0.113	10.72	8.87	-12.0	-12.0	-6.7	26.4	26.1	14.9
900524	1300	0.60	0.093	0.123	10.72	8.16	-16.0	-16.0	-4.6	26.7	26.4	10.4

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,JPO}$ Hz	$T_{p,PM}$ sec	$T_{p,JPO}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,JPO}$ deg	$\theta_{p,mv}$ deg	$\Delta\theta_{mo}$ deg	$\Delta\theta_{mv}$ deg	$\Delta\theta_{mp}$ deg
900524	1900	0.51	0.132	0.132	7.56	7.56	0.0	14.0	1.1	35.6	37.6	25.1
900525	0100	0.45	0.142	0.123	7.04	8.16	14.0	12.0	-1.2	40.3	37.6	38.5
900525	0700	0.51	0.132	0.123	7.56	8.16	-2.0	16.0	7.1	37.2	31.0	28.7
900525	1300	0.63	0.132	0.132	7.56	7.56	18.0	6.0	-2.9	36.4	35.2	35.8
900525	1900	0.63	0.123	0.123	8.16	8.16	-20.0	14.0	-2.6	33.7	33.5	34.3
900526	0100	0.69	0.093	0.113	10.72	8.87	-14.0	-14.0	-11.4	31.1	31.7	26.0
900526	0700	0.95	0.083	0.083	11.98	11.98	-10.0	-14.0	-7.7	28.1	28.3	27.0
900526	1300	1.03	0.083	0.083	11.98	11.98	-14.0	-14.0	-14.3	25.8	25.8	26.2
900526	1900	0.88	0.083	0.083	11.98	11.98	-12.0	-12.0	-18.0	29.8	28.4	24.9
900527	0100	0.71	0.093	0.093	10.72	10.72	-14.0	-14.0	-16.1	29.7	29.1	29.2
900527	0700	0.68	0.093	0.093	10.72	10.72	2.0	12.0	-16.6	42.6	38.3	27.9
900527	1300	1.05	0.210	0.093	4.75	10.72	42.0	40.0	18.4	40.9	29.1	16.4
900527	1900	1.05	0.171	0.093	5.83	10.72	22.0	24.0	21.3	37.1	29.9	17.4
900528	0100	0.92	0.162	0.152	6.19	6.58	24.0	20.0	20.7	39.2	35.0	21.5
900528	0700	1.04	0.162	0.142	6.19	7.04	28.0	16.0	10.4	35.2	31.8	29.0
900528	1300	1.07	0.230	0.230	4.35	4.35	28.0	18.0	15.5	38.5	36.1	33.0
900528	1900	1.05	0.210	0.220	4.75	4.54	14.0	14.0	6.2	38.3	37.7	25.7
900529	0100	1.02	0.113	0.103	8.87	9.71	2.0	2.0	-3.6	47.3	41.8	22.8
900529	0700	0.96	0.171	0.171	5.83	5.83	-44.0	-44.0	-25.3	47.1	42.4	36.0
900529	1300	0.90	0.152	0.152	6.58	6.58	-44.0	-44.0	-29.8	47.2	37.2	19.3
900529	1900	1.01	0.152	0.123	6.58	8.16	-46.0	-42.0	-18.1	49.1	38.1	33.6
900530	0100	0.92	0.318	0.103	3.15	9.71	56.0	56.0	6.0	83.0	29.5	5.3
900530	0700	0.99	0.191	0.103	5.24	9.71	46.0	54.0	22.9	54.1	20.6	8.0
900530	1900	0.87	0.113	0.132	8.87	7.56	-38.0	36.0	1.4	56.5	30.5	28.1
900531	0700	0.73	0.113	0.113	8.87	8.87	-40.0	-28.0	-2.1	51.6	27.7	28.3
900531	1300	0.74	0.123	0.064	8.16	15.62	-44.0	-42.0	-8.2	46.8	34.0	23.4
900531	1900	0.77	0.064	0.064	15.62	15.62	-4.0	-18.0	-12.1	42.2	32.0	22.1
900601	0100	0.69	0.123	0.123	8.16	8.16	-32.0	-30.0	-9.4	38.9	35.9	35.6
900601	0700	0.66	0.064	0.064	15.62	15.62	-8.0	-18.0	-16.4	32.8	32.9	18.7
900601	1000	0.65	0.064	0.123	15.62	8.16	-14.0	-12.0	-21.1	32.1	31.9	22.3
900601	1600	0.60	0.064	0.064	15.62	15.62	-14.0	-14.0	-25.3	30.7	31.5	18.8
900601	1900	0.56	0.064	0.123	15.62	8.16	-14.0	-14.0	-20.3	29.6	29.6	20.3
900601	2200	0.57	0.123	0.123	8.16	8.16	-36.0	-22.0	-23.3	30.0	30.4	30.1
900602	0100	0.55	0.074	0.074	13.57	13.57	-12.0	-16.0	-28.7	28.5	27.5	17.4
900602	0400	0.52	0.064	0.064	15.62	15.62	-14.0	-14.0	-19.6	28.7	27.9	20.6
900602	0700	0.48	0.132	0.074	7.56	13.57	-36.0	-14.0	-23.7	31.0	27.0	25.7
900602	1000	0.46	0.074	0.074	13.57	13.57	-14.0	-14.0	-28.8	30.8	26.8	23.2
900602	1300	0.50	0.318	0.074	3.15	13.57	-52.0	-52.0	-33.4	37.4	22.0	5.3
900602	1600	0.50	0.308	0.074	3.25	13.57	-52.0	-52.0	-34.9	36.8	19.0	5.3
900602	1900	0.45	0.289	0.074	3.47	13.57	-54.0	-54.0	-32.3	34.8	19.6	3.9
900602	2200	0.44	0.074	0.074	13.57	13.57	-18.0	-30.0	-29.8	30.5	22.0	23.0
900603	0100	0.44	0.123	0.074	8.16	13.57	-36.0	-36.0	-33.3	31.4	21.7	26.1
900603	0400	0.43	0.074	0.074	13.57	13.57	-12.0	-38.0	-31.4	31.0	21.0	24.2
900603	0700	0.42	0.074	0.074	13.57	13.57	-16.0	-36.0	-32.2	27.9	18.1	19.9
900603	1000	0.42	0.074	0.074	13.57	13.57	-18.0	-38.0	-32.1	27.3	16.7	21.8
900603	1300	0.58	0.259	0.074	3.86	13.57	-48.0	-48.0	-39.2	20.3	11.5	5.3
900603	1600	0.56	0.230	0.074	4.35	13.57	-44.0	-46.0	-38.9	17.8	10.9	4.3
900603	1900	0.54	0.269	0.113	3.72	8.87	-50.0	-50.0	-40.9	21.3	10.5	4.5
900603	2200	0.50	0.289	0.113	3.47	8.87	-52.0	-52.0	-40.9	20.6	10.5	3.8
900604	0100	0.62	0.171	0.171	5.83	5.83	-44.0	-44.0	-39.8	17.2	10.1	5.4
900604	0400	0.65	0.171	0.171	5.83	5.83	-44.0	-44.0	-40.5	17.4	11.8	5.5
900604	0700	0.61	0.171	0.123	5.83	8.16	-46.0	-46.0	-40.3	18.5	12.4	6.5
900604	1300	0.73	0.162	0.123	6.19	8.16	-44.0	-44.0	-40.6	18.4	15.0	11.5

Table A1 (Continued)

Date	Time EST	H_{m_0} m	f_{p_1} Hz	f_{p_2} Hz	T_{p_1} sec	T_{p_2} sec	θ_{p_1} deg	θ_{p_2} deg	θ_{mean} deg	$\Delta\theta_{p_1}$ deg	$\Delta\theta_{p_2}$ deg	$\Delta\theta_{mean}$ deg
900604	1600	0.70	0.171	0.142	5.83	7.04	-44.0	-44.0	-39.8	22.4	18.8	10.5
900604	1900	1.04	0.210	0.210	4.75	4.75	56.0	60.0	30.1	79.6	23.4	16.2
900604	2200	1.09	0.210	0.220	4.75	4.54	52.0	54.0	34.9	40.8	25.0	20.0
900605	0100	1.19	0.191	0.191	5.24	5.24	38.0	40.0	40.8	30.5	26.5	16.9
900605	0400	1.25	0.191	0.191	5.24	5.24	58.0	58.0	48.7	30.0	24.6	21.1
900605	0700	1.27	0.191	0.191	5.24	5.24	56.0	56.0	42.6	30.5	25.7	22.8
900605	1000	1.12	0.171	0.181	5.83	5.52	26.0	32.0	28.0	31.0	26.7	19.8
900605	1300	0.98	0.171	0.171	5.83	5.83	38.0	36.0	21.3	33.5	27.9	23.1
900605	1900	0.82	0.162	0.318	6.19	3.15	36.0	36.0	18.7	50.3	40.0	49.2
900605	2200	0.73	0.142	0.142	7.04	7.04	22.0	34.0	16.5	49.7	41.1	40.9
900606	0100	0.74	0.162	0.152	6.19	6.58	20.0	18.0	4.7	43.4	37.6	21.0
900606	0400	0.76	0.162	0.162	6.19	6.19	22.0	22.0	-1.1	46.4	38.4	27.4
900606	0700	0.71	0.181	0.123	5.52	8.16	28.0	-34.0	-1.8	47.0	39.3	23.8
900606	1000	0.66	0.132	0.123	7.56	8.16	-16.0	-30.0	-6.8	37.4	37.1	21.8
900606	1300	0.68	0.123	0.123	8.16	8.16	-14.0	-32.0	-27.0	33.8	34.7	22.0
900606	1600	0.66	0.289	0.123	3.47	8.16	-56.0	-54.0	-36.1	42.0	22.9	5.0
900606	1900	0.57	0.308	0.132	3.25	7.56	-54.0	-54.0	-37.1	37.3	23.5	5.9
900606	2200	0.49	0.113	0.113	8.87	8.87	-36.0	-36.0	-31.0	31.5	22.5	24.3
900607	0100	0.45	0.123	0.113	8.16	8.87	-34.0	-34.0	-34.1	29.2	22.8	22.9
900607	0400	0.45	0.123	0.123	8.16	8.16	-36.0	-48.0	-33.8	32.2	21.8	20.8
900607	1000	0.42	0.113	0.113	8.87	8.87	-32.0	-38.0	-35.8	27.1	20.1	18.6
900607	1300	0.42	0.123	0.113	8.16	8.87	-36.0	-36.0	-34.6	27.4	21.6	20.9
900607	1600	0.47	0.132	0.113	7.56	8.87	-34.0	-48.0	-37.6	30.0	18.9	12.3
900607	1900	0.48	0.113	0.113	8.87	8.87	-36.0	-52.0	-39.9	30.3	18.2	21.0
900607	2200	0.41	0.123	0.123	8.16	8.16	-36.0	-52.0	-36.0	30.2	20.2	19.7
900608	0100	0.38	0.113	0.113	8.87	8.87	-34.0	-36.0	-35.5	27.8	22.5	22.6
900608	0400	0.37	0.123	0.113	8.16	8.87	-34.0	-34.0	-34.0	28.9	26.0	20.6
900608	0700	0.37	0.123	0.113	8.16	8.87	-30.0	-34.0	-37.2	30.3	26.1	22.2
900608	1300	0.36	0.123	0.113	8.16	8.87	-36.0	-36.0	-34.7	27.4	24.9	24.9
900608	1900	0.36	0.113	0.113	8.87	8.87	-34.0	-54.0	-38.6	34.9	20.2	26.5
900609	0100	0.28	0.142	0.113	7.04	8.87	-42.0	-40.0	-35.5	31.2	22.9	11.3
900609	0700	0.29	0.113	0.113	8.87	8.87	-36.0	-38.0	-36.7	37.0	30.7	26.5
900609	1300	0.28	0.132	0.113	7.56	8.87	-30.0	-30.0	-36.9	33.7	26.9	22.3
900609	1900	0.34	0.142	0.142	7.04	7.04	-42.0	-56.0	-43.8	24.4	12.4	7.2
900610	0100	0.28	0.123	0.142	8.16	7.04	-36.0	-36.0	-37.2	31.1	27.6	14.6
900610	0700	0.47	0.220	0.220	4.54	4.54	54.0	56.0	19.4	85.7	25.5	18.8
900610	1300	0.33	0.162	0.123	6.19	8.16	-46.0	-44.0	-31.7	43.8	42.1	7.3
900610	1900	0.31	0.152	0.113	6.58	8.87	-44.0	-40.0	-42.9	26.0	24.8	6.4
900611	0100	0.30	0.113	0.113	8.87	8.87	-36.0	-38.0	-27.1	42.0	31.0	12.7
900611	0700	0.80	0.191	0.191	5.24	5.24	48.0	46.0	39.7	13.5	10.5	7.4
900611	1300	0.63	0.191	0.191	5.24	5.24	44.0	44.0	35.8	20.1	15.3	10.2
900612	0100	1.71	0.162	0.162	6.19	6.19	40.0	40.0	36.3	20.4	19.1	18.5
900612	0700	1.56	0.152	0.152	6.58	6.58	38.0	38.0	34.9	22.4	22.1	20.4
900612	1300	1.59	0.123	0.123	8.16	8.16	6.0	38.0	26.5	29.0	25.0	32.1
900612	1900	1.64	0.152	0.123	6.58	8.16	16.0	16.0	16.8	35.2	28.3	24.8
900613	0100	1.81	0.103	0.103	9.71	9.71	-8.0	12.0	5.0	31.9	29.1	30.6
900613	0700	1.77	0.083	0.093	11.98	10.72	-8.0	-10.0	-0.6	34.9	32.3	28.6
900613	1000	1.86	0.083	0.093	11.98	10.72	-14.0	-14.0	0.8	30.6	26.8	22.0
900613	1300	1.94	0.083	0.074	11.98	13.57	-14.0	-14.0	-2.8	25.9	22.8	14.6
900613	1600	2.03	0.083	0.083	11.98	11.98	-16.0	-14.0	-6.5	21.8	19.5	13.4
900614	0100	1.79	0.083	0.083	11.98	11.98	-10.0	-12.0	-9.0	19.2	20.0	13.9
900614	0700	1.90	0.083	0.083	11.98	11.98	-12.0	-10.0	-9.1	20.8	20.4	18.4
900615	0100	1.12	0.093	0.103	10.72	9.71	-14.0	-12.0	-2.7	25.1	26.8	18.8

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,JON}$ Hz	$f_{p,PM}$ Hz	$T_{p,JON}$ sec	$T_{p,PM}$ sec	$\theta_{p,JON}$ deg	$\theta_{p,PM}$ deg	$\theta_{p,MEM}$ deg	$\Delta\theta_{JON}$ deg	$\Delta\theta_{PM}$ deg	$\Delta\theta_{MEM}$ deg
900615	0700	1.14	0.103	0.103	9.71	9.71	16.0	4.0	-0.5	31.7	32.6	32.8
900615	1300	0.97	0.103	0.103	9.71	9.71	-14.0	-16.0	-0.2	34.8	34.6	30.1
900615	1900	0.95	0.103	0.113	9.71	8.87	-18.0	6.0	-9.3	36.9	33.5	27.5
900616	0100	0.95	0.113	0.113	8.87	8.87	-32.0	-30.0	-15.7	35.4	33.8	31.7
900616	0700	0.90	0.113	0.113	8.87	8.87	-32.0	-30.0	-16.8	36.2	32.1	32.6
900616	1300	0.88	0.113	0.113	8.87	8.87	-38.0	-34.0	-15.5	42.1	36.3	38.7
900616	1900	0.87	0.113	0.113	8.87	8.87	-38.0	-36.0	-12.9	41.4	33.7	33.9
900617	0100	0.85	0.113	0.113	8.87	8.87	-36.0	-34.0	-17.0	37.7	33.1	33.3
900617	0700	0.76	0.113	0.113	8.87	8.87	-36.0	-38.0	-19.6	40.6	33.8	33.3
900617	1900	0.90	0.113	0.113	8.87	8.87	-36.0	-18.0	-8.0	37.6	31.4	26.8
900618	0100	0.87	0.113	0.113	8.87	8.87	-28.0	-26.0	-11.9	35.7	29.7	27.6
900618	0700	0.83	0.113	0.113	8.87	8.87	-26.0	-26.0	-15.1	30.9	28.5	24.9
900618	1300	0.85	0.113	0.113	8.87	8.87	-32.0	-28.0	-18.5	32.6	33.5	28.0
900618	1900	0.77	0.113	0.113	8.87	8.87	-24.0	-26.0	-28.8	26.0	26.0	18.3
900619	0100	0.78	0.123	0.113	8.16	8.87	-28.0	-26.0	-26.7	28.4	28.9	20.0
900619	0700	0.75	0.113	0.113	8.87	8.87	-32.0	-30.0	-29.6	23.6	24.9	20.4
900619	1900	0.71	0.113	0.113	8.87	8.87	-36.0	-54.0	-39.8	33.2	20.6	25.3
900620	0100	0.71	0.113	0.113	8.87	8.87	-36.0	-36.0	-25.1	36.8	32.7	34.0
900620	0700	0.90	0.240	0.113	4.17	8.87	64.0	66.0	20.0	79.9	26.0	12.4
900620	1900	0.58	0.113	0.113	8.87	8.87	-3[illegible].0	-38.0	-32.3	38.3	32.1	33.5
900621	0100	0.63	0.113	0.113	8.87	8.87	-38.0	-38.0	-34.1	34.8	33.5	30.5
900621	0700	0.61	0.113	0.113	8.87	8.87	-38.0	-38.0	-29.5	35.0	31.4	32.8
900621	1900	0.58	0.123	0.113	8.16	8.87	-38.0	-38.0	-32.[illegible]	38.8	32.3	32.2
900622	0100	0.60	0.113	0.113	8.87	8.87	-32.0	-36.0	-30.3	35.1	30.6	35.3
900624	1300	0.43	0.113	0.113	8.87	8.87	-38.0	-38.0	-39.5	26.7	25.9	18.8
900624	1900	0.48	0.113	0.113	8.87	8.87	-34.0	-40.0	-35.9	18.6	17.6	11.7
900625	0100	0.39	0.113	0.113	8.87	8.87	-36.0	-38.0	-40.0	24.9	20.7	18.3
900625	1300	0.53	0.113	0.113	8.87	8.87	-36.0	-36.0	-14.9	53.4	24.7	20.0
900625	1900	0.50	0.123	0.123	8.16	8.16	-38.0	-38.0	-23.0	43.6	31.3	26.4
900626	0100	0.52	0.113	0.113	8.87	8.87	-36.0	-36.0	-31.1	35.5	35.4	20.3
900626	0700	0.47	0.123	0.123	8.16	8.16	-36.0	-36.0	-35.6	31.4	31.4	27.5
900626	1300	0.45	0.113	0.113	8.87	8.87	-34.0	-32.0	-32.1	27.0	27.8	23.4
900626	1900	0.51	0.123	0.123	8.16	8.16	-24.0	-38.0	-37.5	26.4	25.2	17.2
900627	0100	0.46	0.113	0.113	8.87	8.87	-36.0	-38.0	-40.3	27.3	25.9	24.8
900627	0700	0.51	0.123	0.123	8.16	8.16	-36.0	-36.0	-40.1	29.4	24.7	29.0
900627	1300	0.51	0.191	0.123	5.24	8.16	-46.0	-46.0	-39.1	29.6	21.7	13.5
900627	1900	0.47	0.171	0.132	5.83	7.56	-40.0	-38.0	-35.1	22.4	19.4	14.0
900628	0100	0.47	0.162	0.142	6.19	7.04	-42.0	-42.0	-39.3	24.9	21.5	14.0
900628	0700	0.50	0.152	0.132	6.58	7.56	-42.0	-42.0	-36.9	27.9	23.0	16.0
900628	1900	0.45	0.162	0.132	6.19	7.56	-40.0	-40.0	-35.9	19.7	17.9	8.6
900629	0100	0.49	0.132	0.132	7.56	7.56	-28.0	-40.0	-35.2	20.9	19.1	15.7
900629	0700	0.50	0.142	0.142	7.04	7.04	-38.0	-38.0	-36.0	20.0	19.3	16.9
900629	1000	0.49	0.142	0.142	7.04	7.04	-38.0	-40.0	-35.8	21.6	20.8	15.7
900629	1300	0.47	0.142	0.142	7.04	7.04	-40.0	-42.0	-40.2	24.0	20.7	11.6
900629	1900	0.46	0.142	0.142	7.04	7.04	-40.0	-40.0	-40.2	22.8	15.0	15.0
900630	0100	0.42	0.152	0.152	6.58	6.58	-44.0	-42.0	-41.8	23.9	15.4	13.6
900630	0700	0.35	0.123	0.123	8.16	8.16	-36.0	-40.0	-38.5	22.2	18.7	15.7
900630	1300	0.36	0.123	0.123	8.16	8.16	-38.0	-38.0	-37.1	29.2	25.0	15.6
900630	1900	0.36	0.123	0.123	8.16	8.16	-36.0	-36.0	-33.2	24.9	20.1	15.1

Table A1 (Continued)

Date	Time EST	H_{m_o} m	$f_{p,VD}$ Hz	$f_{p,PE}$ Hz	$T_{p,VD}$ sec	$T_{p,PE}$ sec	$\theta_{p,VD}$ deg	$\theta_{p,PE}$ deg	$\theta_{p,DW}$ deg	$\Delta\theta_{ds}$ deg	$\Delta\theta_{dw}$ deg	$\Delta\theta_{pw}$ deg
900701	0700	0.30	0.123	0.074	8.16	13.57	-36.0	-38.0	-34.2	29.0	25.2	20.3
900701	1300	0.39	0.074	0.123	13.57	8.16	-16.0	-50.0	-36.9	30.2	15.9	16.7
900701	1900	1.00	0.191	0.191	5.24	5.24	42.0	56.0	44.9	25.0	22.3	17.0
900702	0100	0.43	0.220	0.083	4.54	11.98	66.0	-38.0	15.0	84.2	31.1	20.8
900702	0700	0.62	0.250	0.250	4.01	4.01	50.0	48.0	35.1	22.9	18.1	14.2
900702	1300	0.98	0.210	0.191	4.75	5.24	44.0	44.0	36.4	17.5	16.5	13.3
900702	1900	0.74	0.171	0.171	5.83	5.83	32.0	30.0	26.8	20.4	18.4	9.8
900703	0100	0.68	0.191	0.191	5.24	5.24	32.0	30.0	27.1	23.5	20.5	12.9
900703	0700	0.87	0.152	0.152	6.58	6.58	16.0	22.0	22.2	19.3	18.4	17.7
900703	1300	0.82	0.142	0.142	7.04	7.04	10.0	10.0	15.8	25.3	24.3	23.0
900703	1900	0.79	0.132	0.132	7.56	7.56	24.0	12.0	18.1	36.1	33.6	40.5
900704	0100	0.95	0.093	0.093	10.72	10.72	-2.0	10.0	-0.8	32.6	32.4	29.3
900704	0700	0.93	0.093	0.093	10.72	10.72	-14.0	-16.0	-7.7	36.4	36.6	38.6
900704	1300	0.78	0.093	0.103	10.72	9.71	-14.0	-18.0	-14.1	32.8	32.2	28.2
900704	1900	0.62	0.103	0.103	9.71	9.71	-22.0	-36.0	-31.4	30.4	26.6	30.2
900705	0100	0.46	0.103	0.103	9.71	9.71	-34.0	-34.0	-34.0	26.8	22.8	27.6
900705	0700	0.43	0.113	0.103	8.87	9.71	-32.0	-32.0	-30.8	23.5	21.8	17.9
900705	1300	0.45	0.113	0.113	8.87	8.87	-34.0	-34.0	-35.7	20.2	18.3	17.4
900705	1900	0.45	0.113	0.113	8.87	8.87	-30.0	-50.0	-37.7	27.8	13.0	14.5
900706	0100	0.37	0.103	0.113	9.71	8.87	-30.0	-32.0	-36.5	27.8	16.8	16.2
900706	0700	0.49	0.113	0.113	8.87	8.87	-16.0	-14.0	12.6	81.5	25.8	20.7
900706	1300	0.43	0.113	0.113	8.87	8.87	-34.0	-34.0	-7.4	54.5	22.8	19.2
900706	1900	0.42	0.113	0.113	8.87	8.87	-34.0	42.0	3.2	66.3	23.7	15.9
900707	0100	0.59	0.269	0.269	3.72	3.72	42.0	42.0	21.6	49.1	23.0	18.4
900707	0700	0.81	0.230	0.259	4.35	3.86	40.0	42.0	29.7	33.5	24.7	17.3
900707	1300	0.86	0.191	0.210	5.24	4.75	44.0	42.0	25.0	40.6	31.0	16.7
900707	1900	0.98	0.171	0.171	5.83	5.83	36.0	36.0	17.8	42.0	33.1	24.3
900708	0100	1.17	0.181	0.171	5.52	5.83	18.0	4.0	4.3	35.0	29.7	25.3
900708	0700	1.01	0.191	0.191	5.24	5.24	18.0	-10.0	7.2	41.8	39.1	44.3
900708	1900	0.92	0.132	0.191	7.56	5.24	-16.0	-40.0	-33.4	40.0	35.6	26.6
900709	0100	0.79	0.123	0.181	8.16	5.52	-12.0	-34.0	-32.5	30.9	30.0	20.2
900709	0700	0.75	0.142	0.142	7.04	7.04	-28.0	-34.0	-31.3	25.8	23.4	19.4
900709	1300	0.68	0.162	0.152	6.19	6.58	-40.0	-38.0	-35.3	27.4	22.9	26.0
900709	1900	0.71	0.171	0.162	5.83	6.19	-40.0	-38.0	-41.0	24.0	18.9	18.3
900710	0100	0.48	0.181	0.152	5.52	6.58	-46.0	-34.0	-36.2	25.6	18.8	16.4
900710	0700	0.39	0.103	0.103	9.71	9.71	-34.0	-36.0	-36.4	29.4	25.6	22.5
900710	1300	0.41	0.103	0.103	9.71	9.71	-18.0	-34.0	-36.3	29.3	25.1	17.9
900710	1900	0.46	0.103	0.103	9.71	9.71	-34.0	-34.0	-37.0	30.6	18.3	22.6
900711	0100	0.44	0.103	0.103	9.71	9.71	-28.0	-40.0	-39.4	24.2	16.5	15.3
900711	0700	0.47	0.103	0.103	9.71	9.71	-38.0	-38.0	-33.4	34.2	35.1	27.4
900711	1300	0.46	0.113	0.113	8.87	8.87	-38.0	-38.0	-37.7	32.5	30.2	17.4
900711	1900	0.57	0.103	0.103	9.71	9.71	-34.0	-68.0	-52.4	32.8	13.3	14.7
900712	0100	0.44	0.113	0.103	8.87	9.71	-36.0	-36.0	-38.4	24.2	22.9	14.6
900712	0700	0.57	0.113	0.103	8.87	9.71	-36.0	-40.0	-44.7	26.2	17.5	12.2
900712	1300	0.60	0.152	0.103	6.58	9.71	-46.0	-44.0	-46.4	26.6	12.1	5.4
900712	1900	0.60	0.113	0.113	8.87	8.87	-40.0	-40.0	-44.6	22.8	12.5	16.8
900713	0100	0.52	0.113	0.113	8.87	8.87	-38.0	-40.0	-39.7	19.5	17.6	14.1
900713	0700	0.59	0.113	0.113	8.87	8.87	-36.0	-36.0	-38.8	19.9	17.6	15.7
900713	1300	0.53	0.113	0.113	8.87	8.87	-32.0	-34.0	-40.7	19.5	20.4	11.4
900713	1900	0.61	0.113	0.132	8.87	7.56	-38.0	-42.0	-20.3	64.5	44.6	15.3
900714	0100	0.70	0.132	0.132	7.56	7.56	26.0	-44.0	-13.0	67.1	48.5	63.8

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p/o}$ Hz	$f_{p/rs}$ Hz	$T_{p/o}$ sec	$T_{p/rs}$ sec	$\theta_{p/o}$ deg	$\theta_{p/rs}$ deg	$\theta_{p/av}$ deg	$\Delta\theta_{os}$ deg	$\Delta\theta_{av}$ deg	$\Delta\theta_{rav}$ deg
900714	0700	0.79	0.132	0.142	7.56	7.04	16.0	20.0	-5.4	62.4	46.6	25.6
900714	1300	0.89	0.113	0.132	8.87	7.56	-38.0	-38.0	-27.6	65.2	38.3	29.2
900714	1900	0.85	0.113	0.132	8.87	7.56	-38.0	-38.0	-38.7	41.5	32.2	16.5
900715	0100	0.79	0.162	0.142	6.19	7.04	-44.0	-44.0	-31.6	44.4	35.3	43.5
900715	0700	0.77	0.181	0.162	5.52	6.19	-48.0	-46.0	-44.1	33.7	26.5	25.1
900715	1300	0.68	0.132	0.132	7.56	7.56	-42.0	-44.0	-42.3	24.1	23.5	31.9
900715	1900	0.67	0.142	0.142	7.04	7.04	-40.0	-42.0	-42.7	17.3	13.2	12.6
900716	0100	0.63	0.152	0.162	6.58	6.19	-42.0	-42.0	-42.2	17.9	14.0	9.7
900716	0700	0.46	0.113	0.113	8.87	8.87	-34.0	-44.0	-40.1	24.7	15.5	10.1
900716	1300	0.47	0.132	0.132	7.56	7.56	-38.0	-40.0	-36.7	24.6	18.5	15.1
900716	1900	0.42	0.123	0.123	8.16	8.16	-38.0	-40.0	-36.1	22.7	17.3	13.4
900717	0100	0.44	0.113	0.074	8.87	13.57	-36.0	-44.0	-36.0	29.9	19.4	12.1
900717	0700	0.40	0.123	0.123	8.16	8.16	-40.0	-40.0	-37.0	25.4	17.8	14.2
900717	1300	0.47	0.123	0.074	8.16	13.57	-42.0	-44.0	-37.8	28.4	18.7	13.5
900717	1900	0.41	0.132	0.074	7.56	13.57	-44.0	-34.0	-34.0	29.5	22.6	13.0
900718	0100	0.43	0.132	0.074	7.56	13.57	-36.0	-38.0	-31.4	31.0	22.8	14.6
900718	0700	0.43	0.123	0.074	8.16	13.57	-40.0	-32.0	-32.6	27.0	20.5	15.8
900718	1300	0.47	0.132	0.074	7.56	13.57	-32.0	-42.0	-32.4	31.3	21.2	12.2
900718	1900	0.44	0.132	0.074	7.56	13.57	-42.0	-42.0	-34.2	29.1	20.3	12.7
900719	0100	0.46	0.123	0.074	8.16	13.57	-32.0	-38.0	-34.1	27.2	19.4	10.4
900719	0700	0.41	0.123	0.123	8.16	8.16	-38.0	-38.0	-37.1	27.0	19.1	10.5
900719	1300	0.44	0.123	0.074	8.16	13.57	-38.0	-38.0	-38.6	32.5	21.4	15.2
900719	1900	0.45	0.152	0.132	6.58	7.56	-44.0	-42.0	-36.9	21.4	16.5	8.7
900720	0100	0.43	0.132	0.132	7.56	7.56	-38.0	-40.0	-37.7	21.2	17.8	10.8
900720	0700	0.45	0.132	0.132	7.56	7.56	-42.0	-42.0	-37.5	22.3	18.6	9.3
900720	1300	0.45	0.162	0.142	6.19	7.04	-42.0	-40.0	-35.7	20.0	17.0	8.8
900720	1900	0.45	0.123	0.083	8.16	11.98	-40.0	-42.0	-42.3	25.4	17.0	12.3
900721	0100	0.37	0.162	0.083	6.19	11.98	-40.0	-42.0	-38.6	21.1	15.9	7.8
900721	0700	0.38	0.123	0.083	8.16	11.98	-40.0	-42.0	-38.1	29.1	19.6	11.6
900722	0100	0.32	0.123	0.083	8.16	11.98	-38.0	-38.0	-37.0	28.4	20.4	13.2
900722	0700	0.37	0.123	0.083	8.16	11.98	-30.0	-30.0	-39.6	40.2	27.7	18.7
900722	1300	0.32	0.132	0.132	7.56	7.56	-36.0	-38.0	-33.2	28.7	21.3	14.9
900723	0100	0.34	0.142	0.123	7.04	8.16	-36.0	-36.0	-36.2	32.6	24.8	29.9
900723	0700	0.39	0.132	0.054	7.56	18.45	-38.0	-22.0	-30.6	34.8	32.3	28.9
900724	0100	0.37	0.113	0.113	8.87	8.87	-30.0	-32.0	-33.0	29.2	23.6	12.6
900724	0700	0.97	0.220	0.220	4.54	4.54	36.0	36.0	35.6	20.4	17.8	12.8
900724	1300	0.79	0.210	0.210	4.75	4.75	46.0	52.0	33.2	22.8	17.5	10.1
900724	1900	0.73	0.191	0.191	5.24	5.24	30.0	30.0	16.9	48.0	22.9	14.8
900725	0100	0.60	0.113	0.113	8.87	8.87	-36.0	44.0	12.1	55.7	22.3	18.5
900725	0700	0.68	0.064	0.064	15.62	15.62	-22.0	24.0	9.1	50.0	27.7	26.8
900725	1300	0.87	0.210	0.210	4.75	4.75	20.0	20.0	15.1	29.2	21.6	15.8
900726	0100	0.89	0.191	0.191	5.24	5.24	36.0	36.0	14.0	43.4	25.9	20.9
900726	0700	1.32	0.191	0.191	5.24	5.24	16.0	20.0	13.7	34.5	24.4	17.2
900726	1300	1.47	0.181	0.181	5.52	5.52	18.0	18.0	14.7	41.2	24.8	17.5
900726	1900	1.60	0.162	0.162	6.19	6.19	38.0	34.0	21.6	37.3	27.7	24.9
900727	0100	1.13	0.152	0.132	6.58	7.56	36.0	42.0	17.5	64.8	47.5	62.1
900727	0700	1.14	0.132	0.132	7.56	7.56	-44.0	-42.0	-20.5	56.5	53.5	38.5
900727	1300	1.11	0.132	0.132	7.56	7.56	-40.0	-40.0	-20.4	41.8	40.9	28.3
900727	1900	1.14	0.123	0.123	8.16	8.16	-42.0	-42.0	-28.7	42.2	34.0	24.7
900728	0100	1.16	0.113	0.113	8.87	8.87	-42.0	-40.0	-22.4	44.4	31.5	16.6

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,JPO}$ Hz	$T_{p,PM}$ sec	$T_{p,JPO}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,JPO}$ deg	$\theta_{p,DIR}$ deg	$\Delta\theta_{pp}$ deg	$\Delta\theta_{mm}$ deg	$\Delta\theta_{mp}$ deg
900728	0700	0.95	0.123	0.123	8.16	8.16	-36.0	-44.0	-17.7	47.1	33.7	28.9
900728	1300	1.12	0.132	0.123	7.56	8.16	-40.0	44.0	2.2	67.5	33.6	28.3
900728	1900	0.98	0.132	0.123	7.56	8.16	-34.0	-36.0	-4.4	58.7	37.5	21.5
900729	0100	1.03	0.123	0.123	8.16	8.16	-44.0	-42.0	-4.4	61.1	47.2	24.0
900729	0700	1.05	0.132	0.132	7.56	7.56	-38.0	-32.0	-22.3	35.9	36.9	27.4
900729	1300	1.26	0.083	0.083	11.98	11.98	-28.0	-38.0	-17.4	36.3	33.9	10.3
900729	1900	1.34	0.093	0.083	10.72	11.98	-32.0	-34.[illegible]	-12.1	43.6	31.0	8.4
900730	0100	1.57	0.093	0.093	10.72	10.72	-38.0	-38.0	-9.8	49.0	28.7	15.5
900730	0700	1.52	0.093	0.093	10.72	10.72	-26.0	-32.0	-5.6	50.9	25.4	20.1
900730	1300	1.47	0.103	0.103	9.71	9.71	-30.0	-30.0	-1.0	48.7	24.8	16.8
900730	1900	1.66	0.093	0.093	10.72	10.72	-26.0	-24.0	-13.2	31.1	24.7	20.9
900731	0100	1.47	0.103	0.103	9.71	9.71	-24.0	-16.0	-13.6	33.7	27.7	23.8
900731	0700	1.55	0.103	0.103	9.71	9.71	-32.0	-14.0	-19.4	30.8	29.6	27.5
900731	1300	1.59	0.083	0.083	11.98	11.98	-6.0	-10.0	-6.2	29.2	28.2	27.0
900731	1900	1.48	0.083	0.083	11.98	11.98	-6.0	-8.0	-12.8	31.2	30.6	33.0
900801	0100	1.64	0.083	0.083	11.98	11.98	-8.0	-12.0	-10.5	28.1	27.6	27.1
900801	0700	1.70	0.083	0.083	11.98	11.98	-18.0	-18.0	6.6	40.1	25.2	22.8
900801	1300	1.37	0.093	0.093	10.72	10.72	-16.0	18.0	10.3	37.2	26.5	29.1
900801	1900	1.17	0.103	0.103	9.71	9.71	-14.0	26.0	14.9	45.9	24.2	32.4
900802	0100	1.09	0.113	0.103	8.87	9.71	-14.0	28.0	13.5	41.4	27.4	30.0
900802	0700	0.79	0.103	0.103	9.71	9.71	-12.0	16.0	9.4	35.2	26.7	25.7
900802	1300	0.77	0.093	0.093	10.72	10.72	2.0	20.0	8.9	33.0	24.9	25.1
900802	1900	0.78	0.113	0.103	8.87	9.71	0.0	0.0	7.3	29.8	23.9	19.5
900803	0100	0.73	0.093	0.103	10.72	9.71	-10.0	8.0	10.8	30.2	25.8	23.3
900803	0700	0.61	0.103	0.103	9.71	9.71	6.0	14.0	15.4	35.3	26.5	25.9
900803	1300	0.55	0.103	0.113	9.71	8.87	-6.0	10.0	7.1	30.9	27.8	25.1
900803	1900	0.52	0.113	0.113	8.87	8.87	-4.0	-2.0	-1.0	29.2	28.4	24.1
900804	0100	0.50	0.113	0.113	8.87	8.87	-14.0	-14.0	-7.5	27.9	26.8	24.1
900804	0700	0.45	0.113	0.113	8.87	8.87	-8.0	-8.0	-10.1	27.1	28.2	21.8
900804	1300	0.50	0.123	0.123	8.16	8.16	-12.0	-14.0	-13.8	21.3	21.3	20.2
900804	1900	0.44	0.123	0.123	8.16	8.16	-18.0	-18.0	-14.0	25.4	24.9	23.2
900805	0100	0.38	0.250	0.103	4.01	9.71	-26.0	-26.0	-14.0	27.1	26.0	10.3
900805	0700	0.33	0.074	0.074	13.57	13.57	-16.0	-16.0	-13.1	26.8	27.2	16.7
900805	1300	0.46	0.308	0.308	3.25	3.25	-56.0	-56.0	-40.7	34.9	20.3	10.1
900806	0100	0.31	0.103	0.103	9.71	9.71	-34.0	-34.0	-32.5	30.8	26.9	22.0
900806	0700	0.33	0.103	0.103	9.71	9.71	-34.0	-34.0	-31.9	29.3	26.8	21.7
900806	1300	0.34	0.113	0.113	8.87	8.87	-36.0	-36.0	-32.6	25.8	23.3	18.1
900806	1900	0.37	0.279	0.103	3.59	9.71	-46.0	-46.0	-36.2	28.4	19.0	4.9
900807	0100	0.33	0.113	0.113	8.87	8.87	-34.0	-34.0	-31.5	27.7	21.1	23.7
900807	1900	0.37	0.230	0.103	4.35	9.71	-52.0	-52.0	-31.2	46.0	32.2	8.0
900808	0100	0.35	0.113	0.113	8.87	8.87	-34.0	-34.0	-28.5	37.6	34.0	30.7
900808	0700	0.41	0.083	0.113	11.98	8.87	-16.0	-14.0	-14.5	32.5	32.3	23.4
900808	1300	0.42	0.083	0.083	11.98	11.98	-18.0	-18.0	-10.6	29.0	30.0	19.4
900808	1900	0.52	0.074	0.093	13.57	10.72	-10.0	-10.0	-4.5	26.6	27.8	14.9
900809	0100	0.56	0.083	0.083	11.98	11.98	-4.0	-6.0	-5.4	33.9	26.9	25.7
900809	0700	0.54	0.083	0.083	11.98	11.98	-12.0	-10.0	-9.7	30.2	29.3	24.1
900809	1300	0.67	0.083	0.083	11.98	11.98	-14.0	-16.0	-36.8	49.7	28.2	26.2
900809	1900	0.77	0.083	0.083	11.98	11.98	-8.0	-8.0	-21.7	45.8	32.6	19.4
900810	0100	0.64	0.083	0.093	11.98	10.72	-14.0	-14.0	-31.9	43.1	31.1	25.8
900810	0700	0.74	0.103	0.093	9.71	10.72	-16.0	-16.0	-37.9	45.4	28.6	22.8
900810	1300	0.68	0.181	0.093	5.52	10.72	-48.0	-18.0	-33.6	36.1	34.3	27.9

(Sheet 28 of 30)

Table A1 (Continued)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,SPE}$ Hz	$T_{p,PM}$ sec	$T_{p,SPE}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,SPE}$ deg	$\theta_{p,MEM}$ deg	$\Delta\theta_{PM}$ deg	$\Delta\theta_{SPE}$ deg	$\Delta\theta_{MEM}$ deg
900810	1900	0.74	0.191	0.103	5.24	9.71	-28.0	-16.0	-24.3	28.4	25.4	15.8
900811	0100	0.56	0.103	0.103	9.71	9.71	4.0	-26.0	-21.4	31.0	31.2	25.9
900811	0700	0.52	0.103	0.103	9.71	9.71	-12.0	-32.0	-25.1	33.1	31.9	26.5
900811	1300	0.50	0.103	0.103	9.71	9.71	-24.0	-32.0	-31.1	35.0	32.8	33.3
900811	1900	0.56	0.181	0.103	5.52	9.71	-42.0	-40.0	-30.2	34.4	29.1	18.9
900812	0100	0.46	0.113	0.103	8.87	9.71	-8.0	-38.0	-33.2	35.3	32.9	25.7
900812	0700	0.47	0.113	0.113	8.87	8.87	-20.0	-44.0	-34.8	37.7	36.3	27.8
900812	1300	0.42	0.103	0.103	9.71	9.71	-8.0	-22.0	-34.5	41.8	39.6	28.7
900812	1900	0.39	0.123	0.103	8.16	9.71	-34.0	-34.0	-36.9	36.7	35.0	33.6
900813	0100	0.39	0.113	0.103	8.87	9.71	-26.0	-28.0	-34.2	36.3	34.6	30.6
900813	0700	0.37	0.113	0.113	8.87	8.87	-20.0	-28.0	-35.8	34.8	30.3	24.6
900813	1300	0.37	0.123	0.113	8.16	8.87	-34.0	-36.0	-36.4	34.2	29.1	28.4
900813	1900	0.43	0.318	0.318	3.15	3.15	-56.0	-54.0	-42.9	29.9	16.3	7.2
900814	0100	0.36	0.103	0.123	9.71	8.16	-34.0	-36.0	-38.3	29.6	20.2	25.7
900814	0700	0.35	0.123	0.123	8.16	8.16	-36.0	-36.0	-35.4	26.9	22.0	19.9
900814	1300	0.40	0.171	0.113	5.83	8.87	-46.0	-44.0	-39.2	26.3	18.6	6.7
900814	1900	0.35	0.142	0.132	7.04	7.56	-42.0	-38.0	-34.9	25.3	24.4	15.6
900815	0100	0.37	0.132	0.123	7.56	8.16	-36.0	-38.0	-32.5	32.6	27.3	23.6
900815	0700	0.36	0.152	0.093	6.58	10.72	-42.0	-40.0	-33.8	32.3	25.1	12.7
900815	1300	0.38	0.093	0.093	10.72	10.72	-22.0	-40.0	-36.5	37.2	36.2	26.3
900815	1900	0.38	0.093	0.093	10.72	10.72	-28.0	-28.0	-20.0	39.0	27.8	23.6
900816	0100	0.47	0.103	0.103	9.71	9.71	-34.0	-14.0	-10.9	44.3	30.7	26.2
900816	0700	0.42	0.093	0.103	10.72	9.71	-28.0	-26.0	-21.6	35.6	28.7	25.4
900816	1300	0.46	0.113	0.113	8.87	8.87	-26.0	-28.0	-24.9	34.7	28.7	25.9
900816	1900	0.50	0.093	0.093	10.72	10.72	-16.0	-22.0	-16.3	35.4	35.1	26.2
900817	0100	0.52	0.103	0.103	9.71	9.71	-12.0	-2.0	-6.3	32.2	29.7	28.4
900817	0700	0.48	0.103	0.103	9.71	9.71	-16.0	-18.0	-15.6	34.5	28.8	25.6
900818	1900	0.64	0.054	0.054	18.45	18.45	-12.0	-14.0	-23.2	30.7	28.8	27.6
900819	1300	0.62	0.064	0.064	15.62	15.62	-20.0	-20.0	-29.2	27.4	22.2	15.4
900820	0100	0.56	0.064	0.064	15.62	15.62	-18.0	-18.0	-25.2	23.5	19.8	17.4
900820	0700	0.57	0.064	0.064	15.62	15.62	-18.0	-18.0	-20.5	27.6	27.6	19.5
900820	1300	0.69	0.064	0.064	15.62	15.62	-10.0	26.0	12.6	40.4	28.1	18.4
900820	1900	1.22	0.250	0.113	4.01	8.87	56.0	56.0	35.7	36.3	22.2	21.3
900821	0100	1.21	0.123	0.123	8.16	8.16	12.0	38.0	26.5	28.7	20.6	24.2
900821	0700	1.28	0.132	0.123	7.56	8.16	24.0	30.0	22.5	26.7	20.6	23.7
900821	1300	1.38	0.181	0.132	5.52	7.56	26.0	26.0	25.9	26.1	21.0	11.8
900821	1900	1.30	0.123	0.113	8.16	8.87	18.0	22.0	22.5	23.2	21.3	24.2
900822	0100	1.19	0.113	0.113	8.87	8.87	8.0	20.0	16.7	24.1	20.0	23.1
900822	0700	1.19	0.113	0.113	8.87	8.87	-16.0	20.0	14.3	31.8	22.0	30.8
900822	1300	1.20	0.113	0.113	8.87	8.87	-6.0	16.0	8.2	29.4	25.0	30.8
900822	1900	1.35	0.123	0.123	8.16	8.16	20.0	16.0	14.1	26.4	24.1	24.0
900823	0100	1.19	0.113	0.113	8.87	8.87	-10.0	14.0	7.8	30.2	25.3	27.9
900823	0700	1.24	0.113	0.113	8.87	8.87	0.0	16.0	9.5	30.3	28.5	32.5
900823	1300	1.07	0.123	0.123	8.16	8.16	8.0	8.0	12.8	38.6	35.7	41.9
900823	1900	1.00	0.123	0.123	8.16	8.16	12.0	14.0	10.2	34.0	32.0	33.7
900824	0100	1.01	0.103	0.113	9.71	8.87	-12.0	12.0	4.0	41.4	40.7	34.1
900824	0700	1.01	0.113	0.113	8.87	8.87	-16.0	0.0	3.4	36.2	33.0	29.7
900824	1300	0.81	0.093	0.103	10.72	9.71	4.0	8.0	3.9	41.3	39.5	23.3
900824	1900	0.84	0.162	0.123	6.19	8.16	12.0	12.0	3.2	47.0	33.1	22.3

Table A1 (Concluded)

Date	Time EST	H_{mo} m	$f_{p,PM}$ Hz	$f_{p,JPO}$ Hz	$T_{p,PM}$ sec	$T_{p,JPO}$ sec	$\theta_{p,PM}$ deg	$\theta_{p,JPO}$ deg	$\theta_{p,DIR}$ deg	$\Delta\theta_{mo}$ deg	$\Delta\theta_{DIR}$ deg	$\Delta\theta_{max}$ deg
900825	0100	0.76	0.240	0.113	4.17	8.87	48.0	48.0	-0.4	58.9	41.4	18.2
900825	0700	0.70	0.123	0.113	8.16	8.87	-40.0	48.0	8.7	59.1	39.4	39.0
900825	1300	0.62	0.113	0.113	8.87	8.87	-36.0	26.0	-12.3	55.2	42.8	36.7
900825	1900	0.52	0.113	0.113	8.87	8.87	-12.0	8.0	-14.1	43.4	45.0	30.5
900826	0100	0.43	0.113	0.113	8.87	8.87	-36.0	-38.0	-36.8	46.5	46.5	36.0
900826	0700	0.41	0.113	0.113	8.87	8.87	-36.0	14.0	-24.7	44.2	43.7	39.2
900826	1300	0.38	0.113	0.113	8.87	8.87	-38.0	-36.0	-27.0	37.5	35.2	31.0
900826	1900	0.35	0.132	0.113	7.56	8.87	-30.0	-30.0	-31.1	38.1	36.2	24.1
900827	0100	0.31	0.123	0.083	8.16	11.98	-34.0	-40.0	-30.1	36.2	32.4	33.9
900827	0700	0.32	0.123	0.123	8.16	8.16	-26.0	-26.0	-28.1	30.4	27.6	19.7
900827	1300	0.32	0.113	0.113	8.87	8.87	-28.0	-28.0	-7.0	53.4	27.3	25.6
900827	1900	0.30	0.113	0.113	8.87	8.87	-26.0	-32.0	-27.9	37.7	32.9	18.9
900828	0100	0.30	0.113	0.123	8.87	8.16	-36.0	-30.0	-31.2	30.0	25.3	17.4
900828	0700	0.28	0.123	0.113	8.16	8.87	-34.0	-34.0	-24.1	33.6	28.8	18.8
900828	1300	0.30	0.103	0.113	9.71	8.87	-30.0	-30.0	-12.2	50.8	25.1	20.8
900828	1900	0.29	0.123	0.113	8.16	8.87	-38.0	-38.0	-24.8	36.4	37.5	19.5
900829	0100	0.27	0.074	0.074	13.57	13.57	-16.0	-18.0	-21.0	34.2	34.1	20.6
900829	0700	0.29	0.074	0.074	13.57	13.57	-36.0	-36.0	-28.1	29.4	28.5	23.4
900829	1300	0.32	0.083	0.083	11.98	11.98	-40.0	-38.0	-37.9	27.8	28.1	21.2
900829	1900	0.43	0.083	0.083	11.98	11.98	-40.0	-40.0	-39.5	24.6	25.3	21.7
900830	0100	0.48	0.083	0.083	11.98	11.98	-32.0	-36.0	-33.2	24.4	25.0	20.6
900830	0400	0.52	0.083	0.083	11.98	11.98	-34.0	-36.0	-32.7	25.0	25.8	22.8
900830	0700	0.66	0.083	0.083	11.98	11.98	-20.0	-34.0	-21.2	27.9	24.2	24.0
900830	1900	1.09	0.083	0.093	11.98	10.72	-40.0	-38.0	5.5	63.4	27.2	22.7
900830	2200	1.16	0.093	0.093	10.72	10.72	-38.0	-36.0	6.4	60.8	26.2	25.3
900831	0100	1.20	0.074	0.074	13.57	13.57	-18.0	-36.0	1.1	56.5	26.9	24.6
900831	0400	1.25	0.074	0.074	13.57	13.57	-12.0	42.0	2.8	52.2	25.2	24.7
900831	1000	1.31	0.083	0.083	11.98	11.98	-20.0	42.0	12.6	51.7	26.4	25.0
900831	1900	1.23	0.083	0.083	11.98	11.98	-20.0	38.0	4.2	49.0	28.2	27.4

(Sheet 30 of 30)

Appendix B
Time Series Graphs of Bulk Parameters

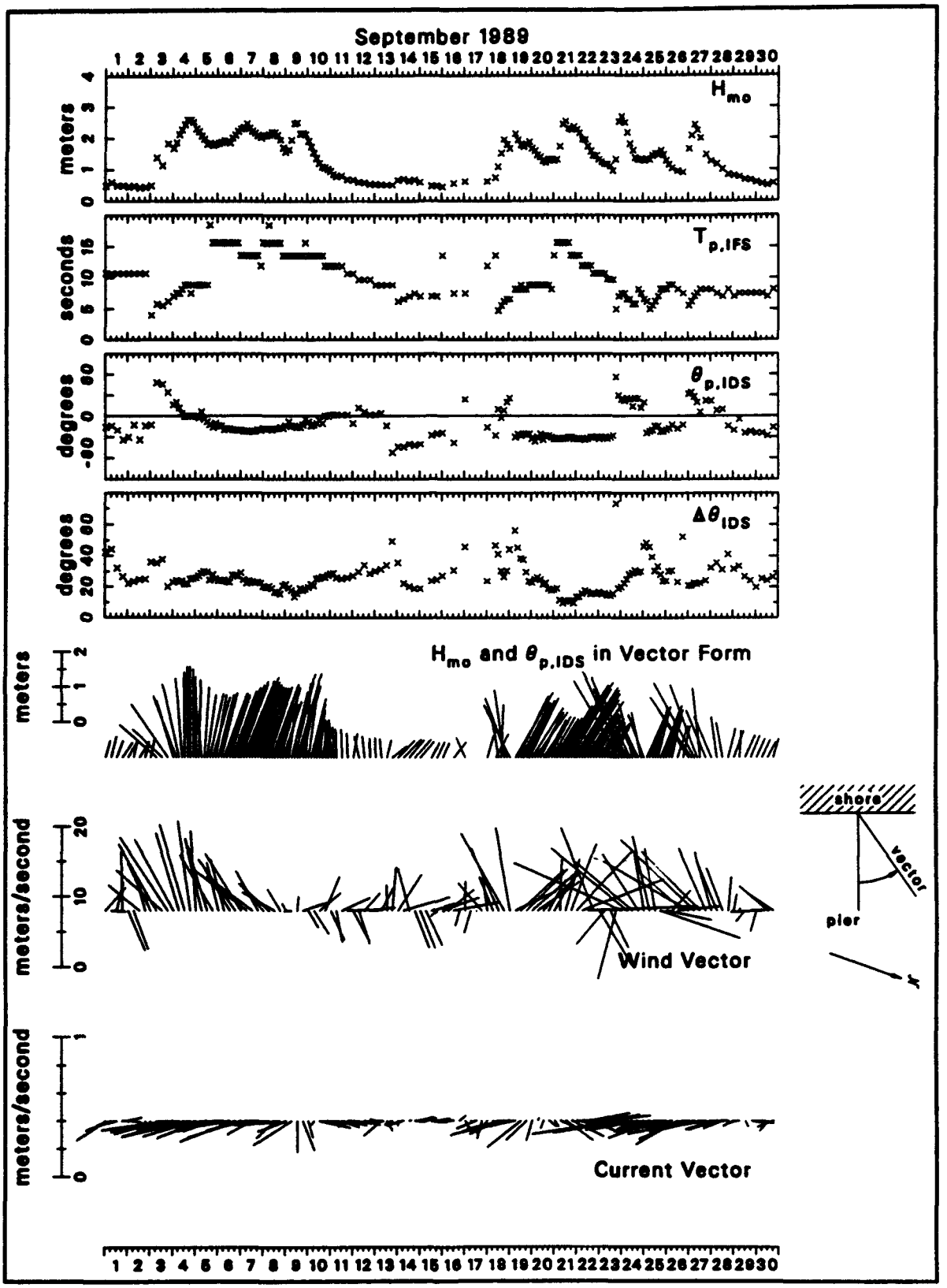


Figure B1. Bulk data for September 1989

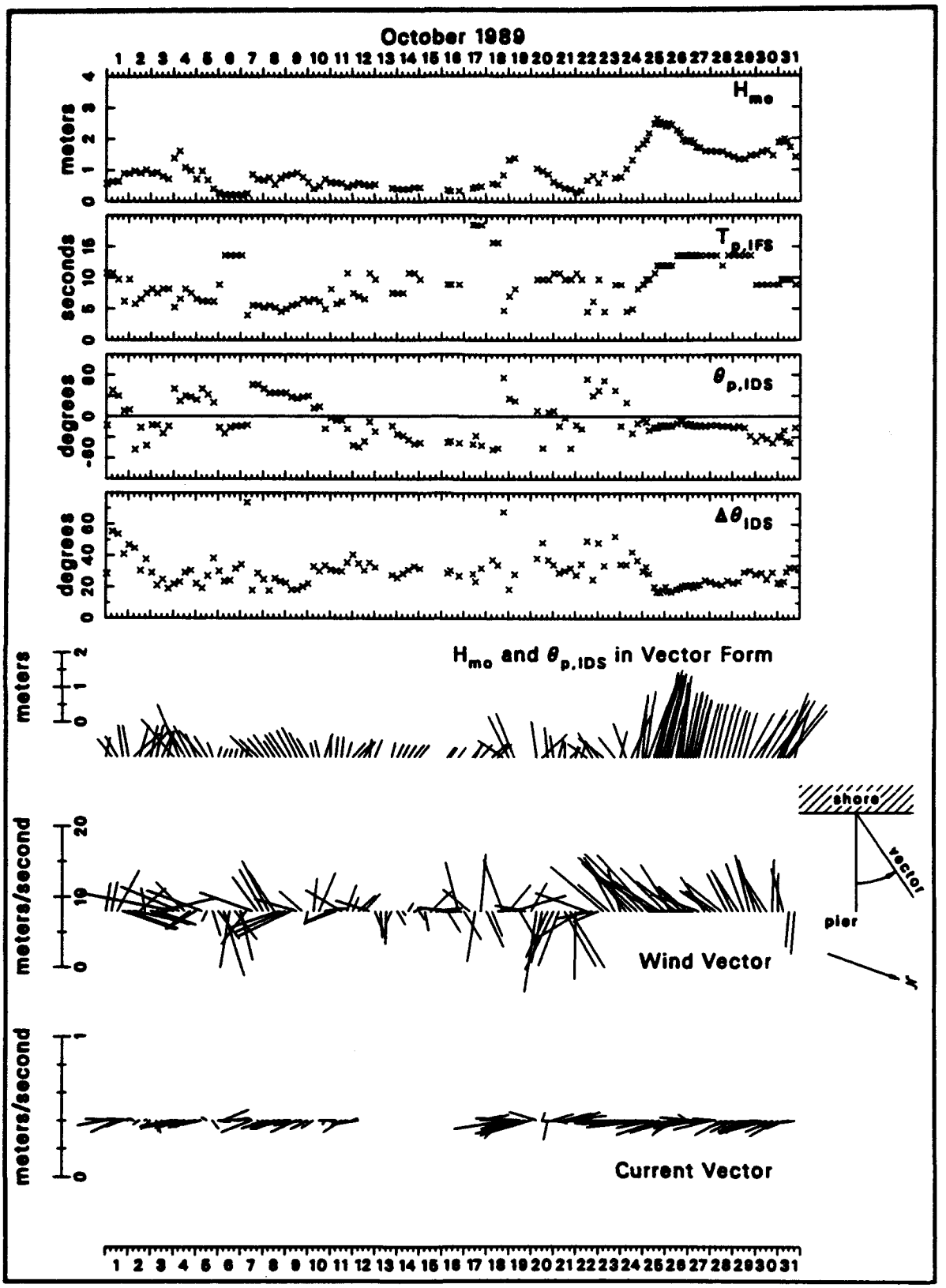


Figure B2. Bulk data for October 1989

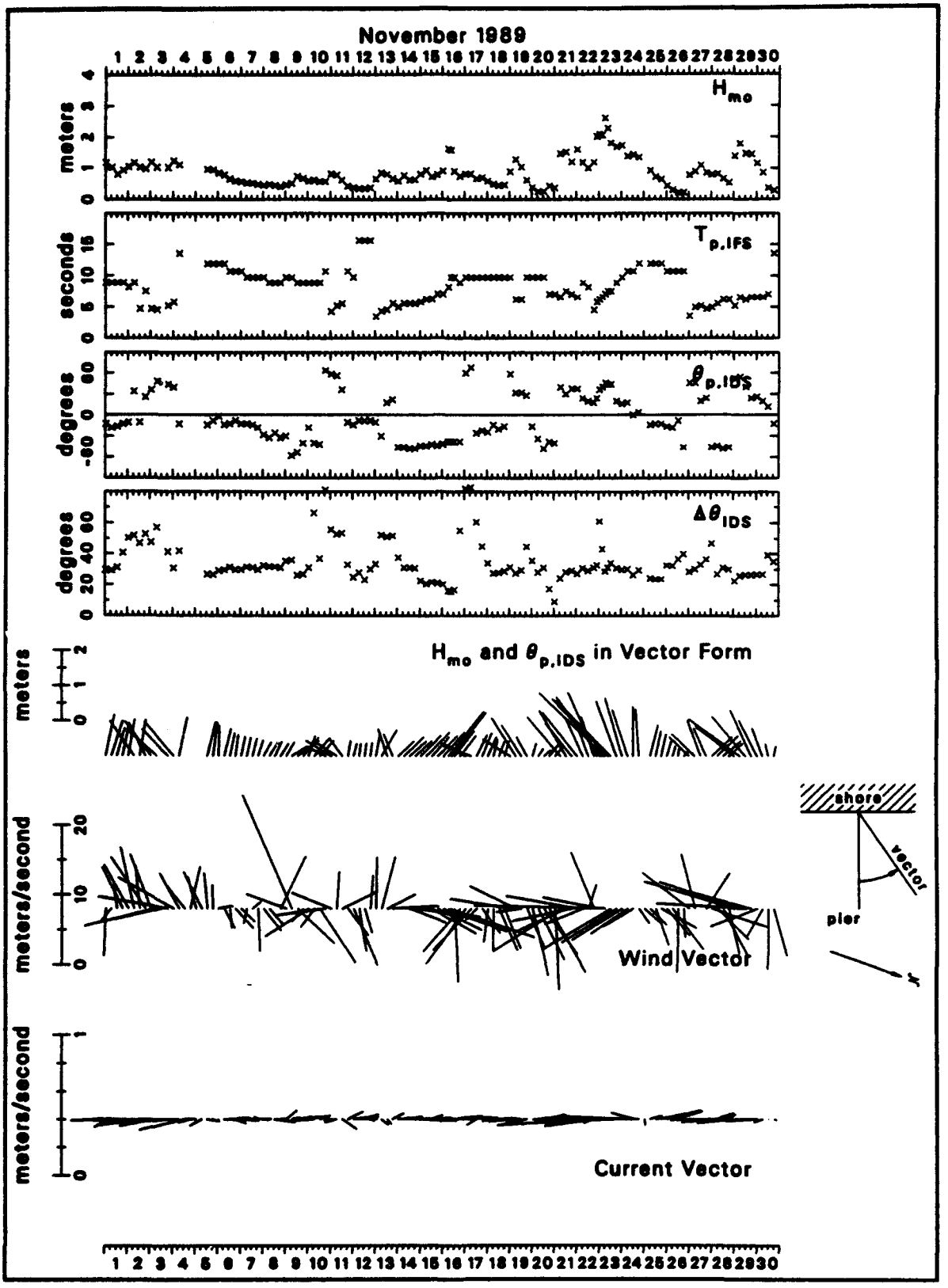


Figure B3. Bulk data for November 1989

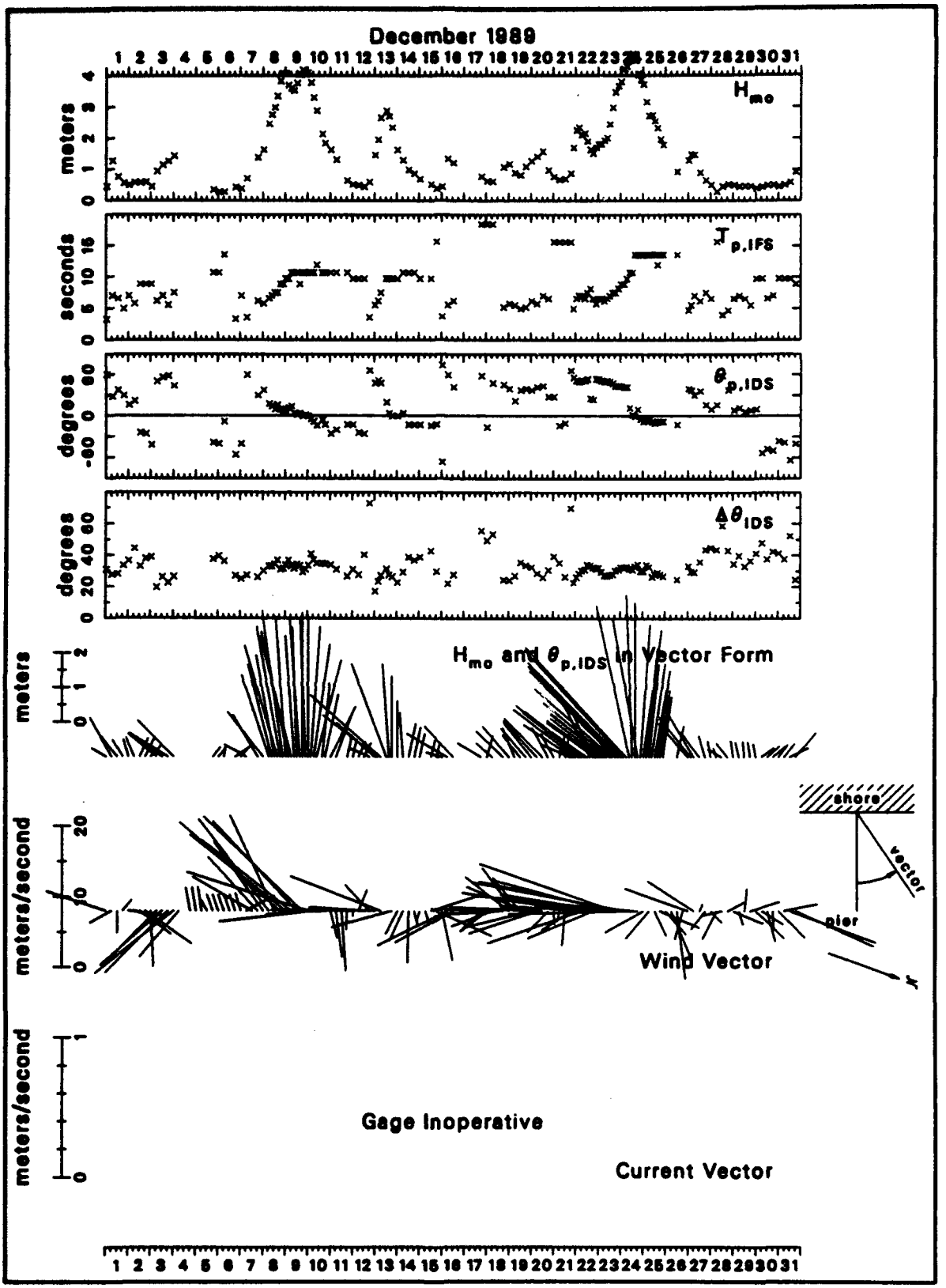


Figure B4. Bulk data for December 1989

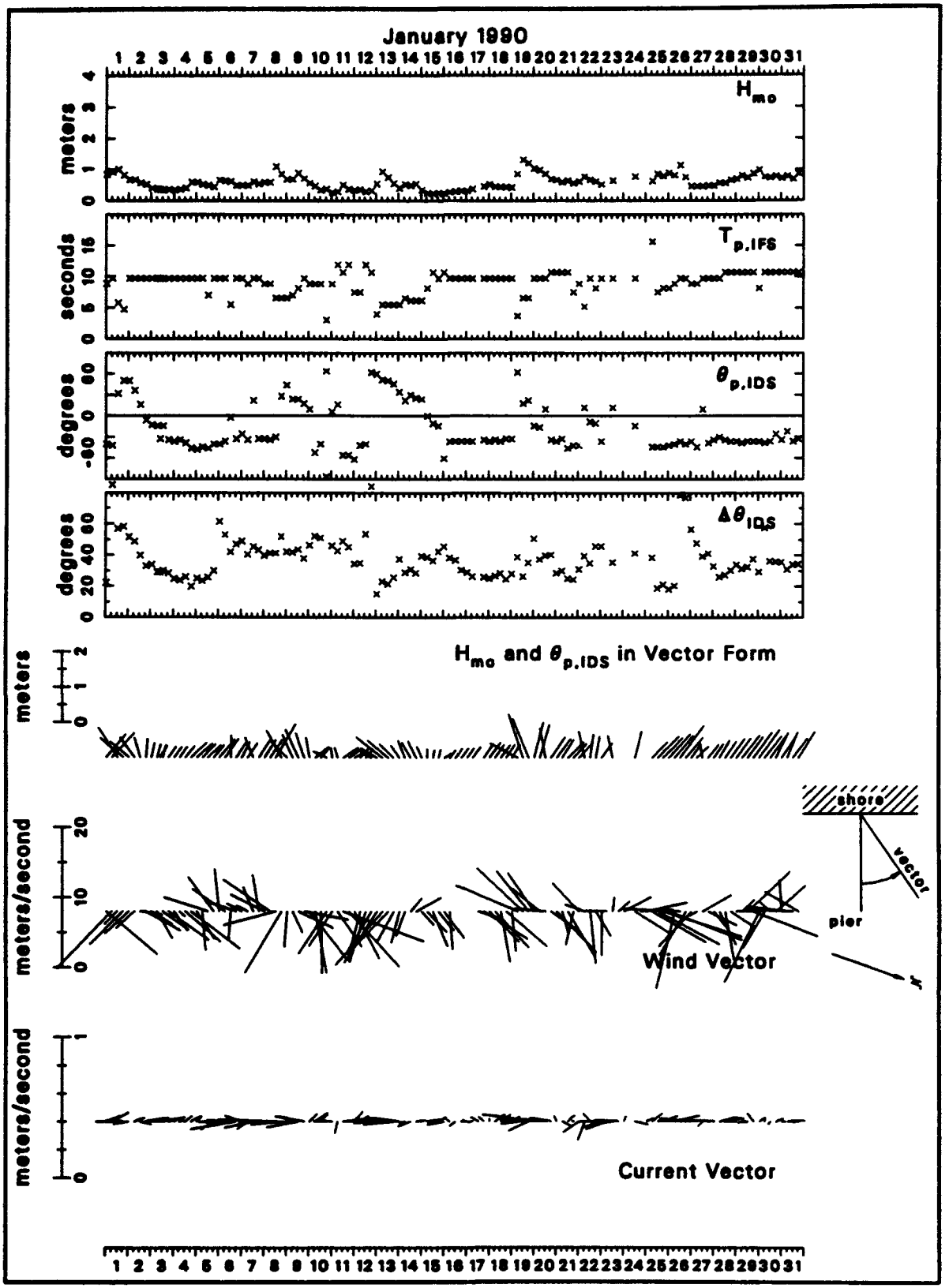


Figure B5. Bulk data for January 1990

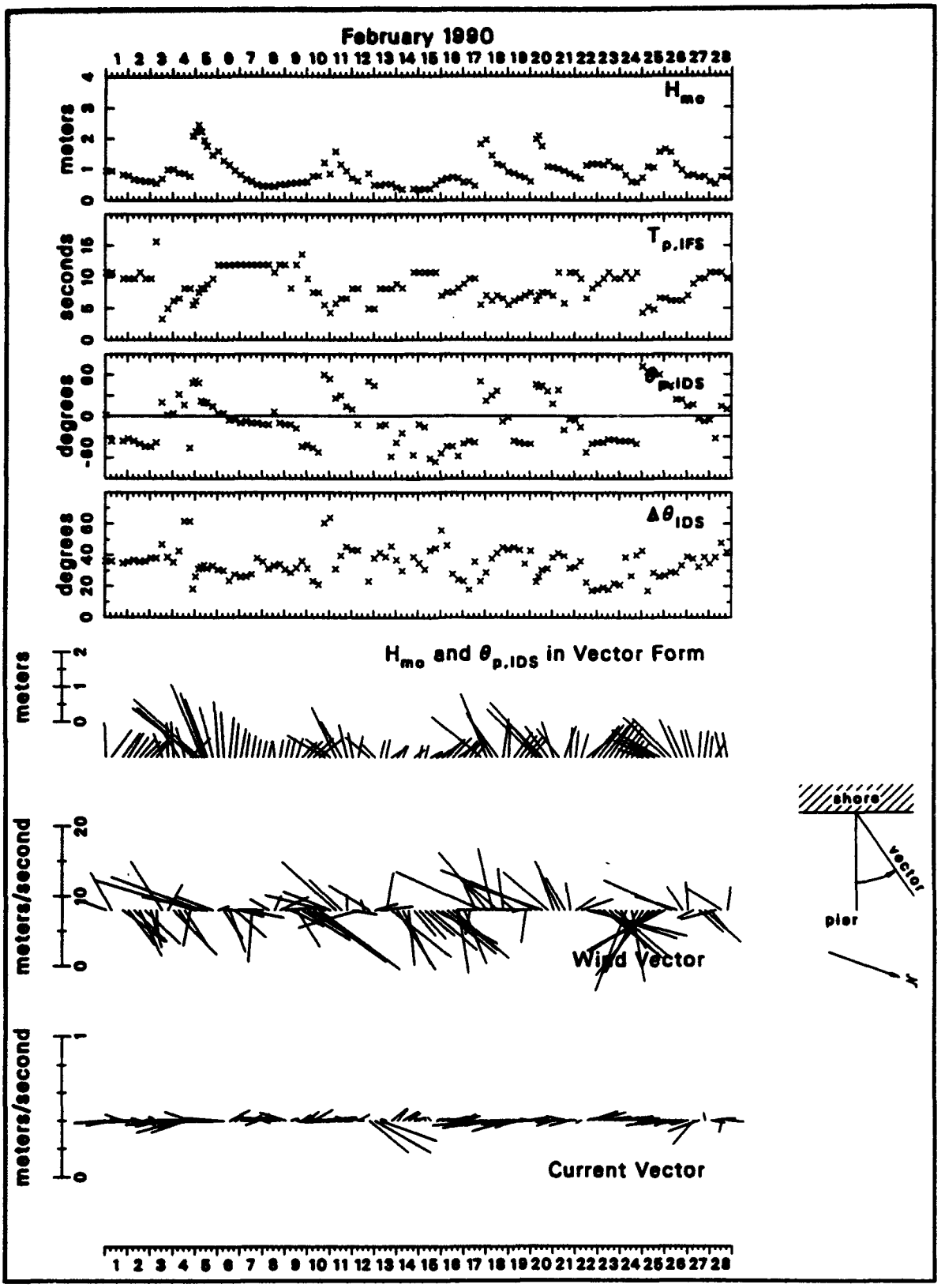


Figure B6. Bulk data for February 1990

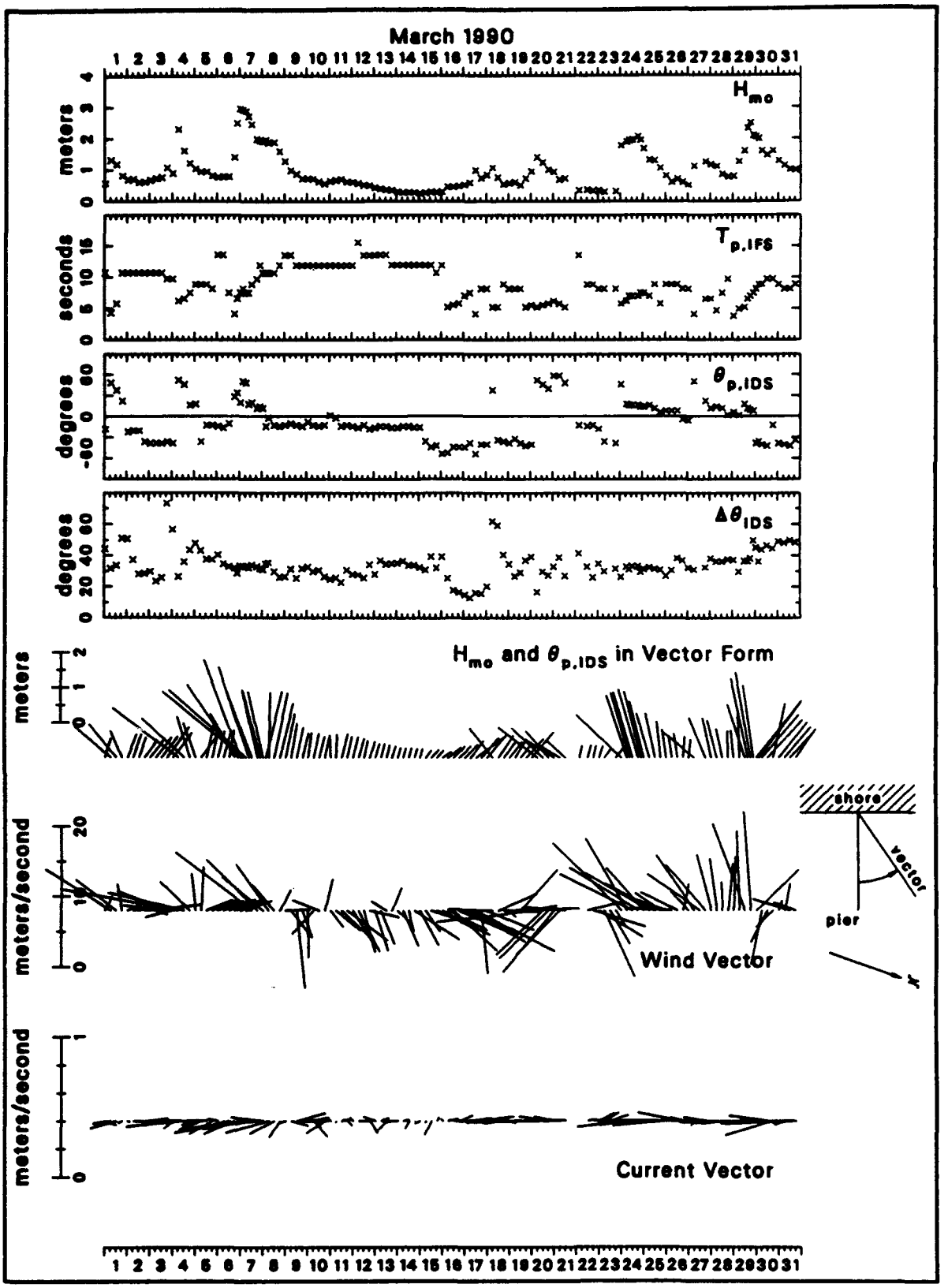


Figure 87. Bulk data for March 1990

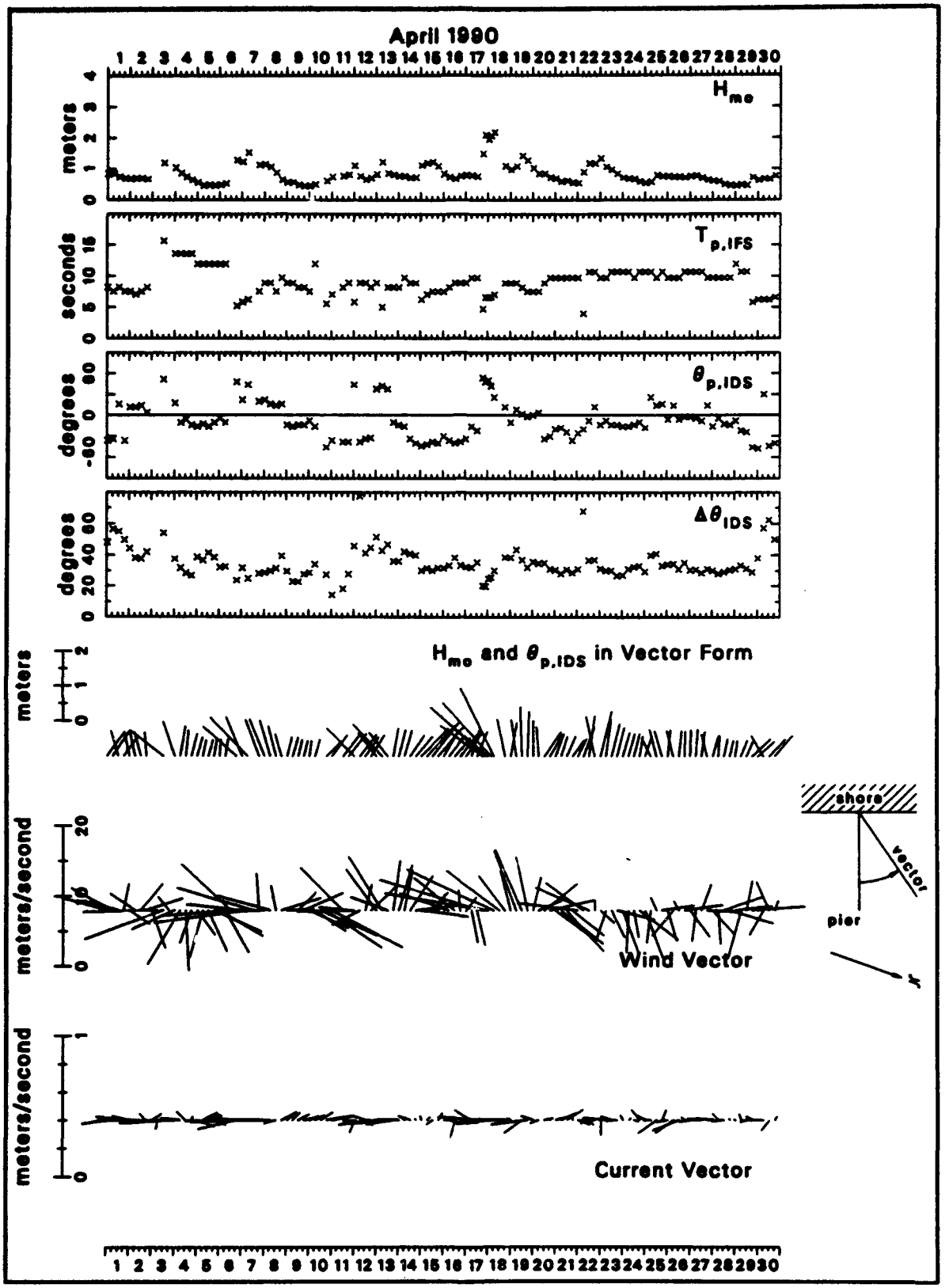


Figure B8. Bulk data for April 1990

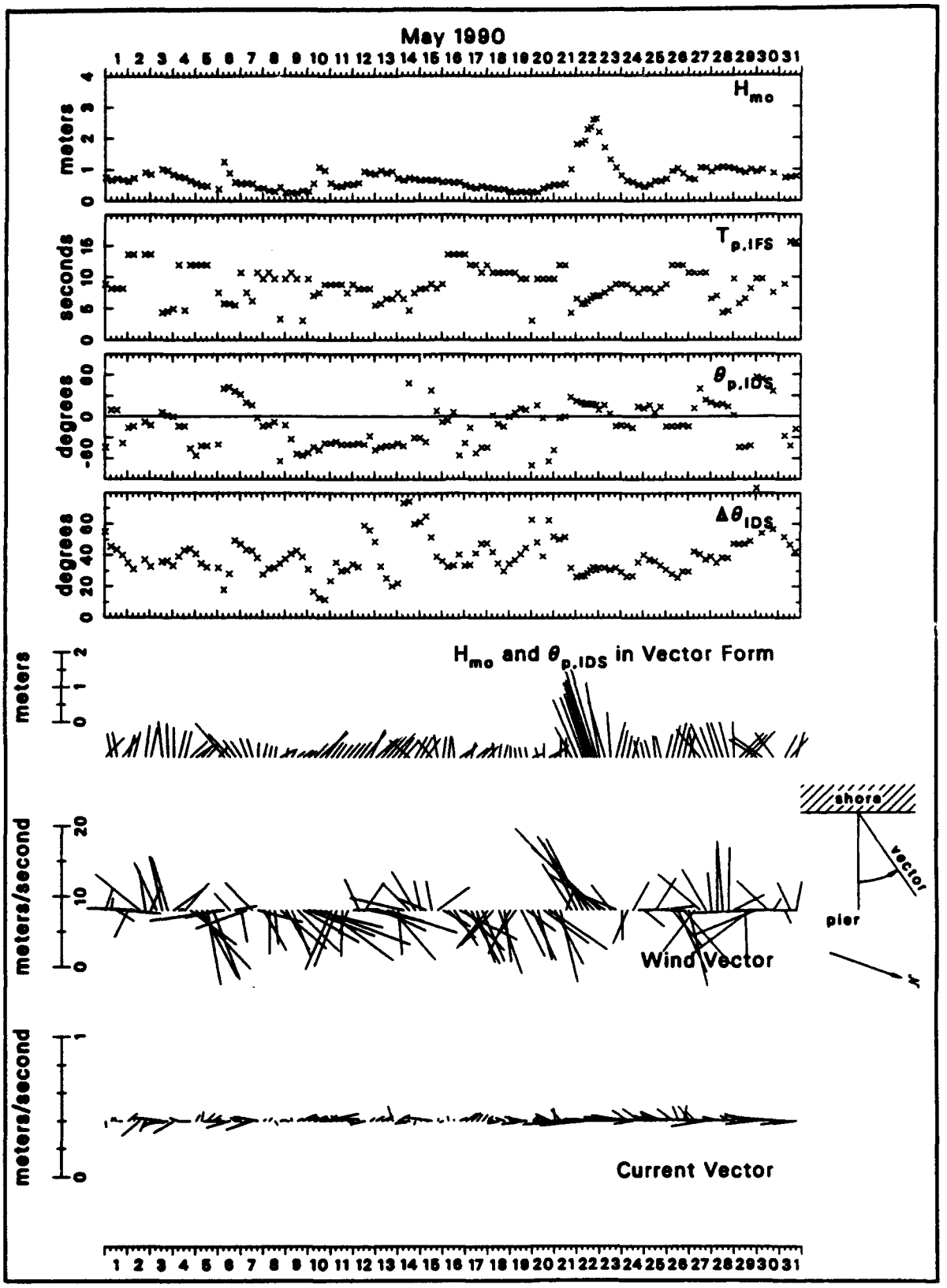


Figure B9. Bulk data for May 1990

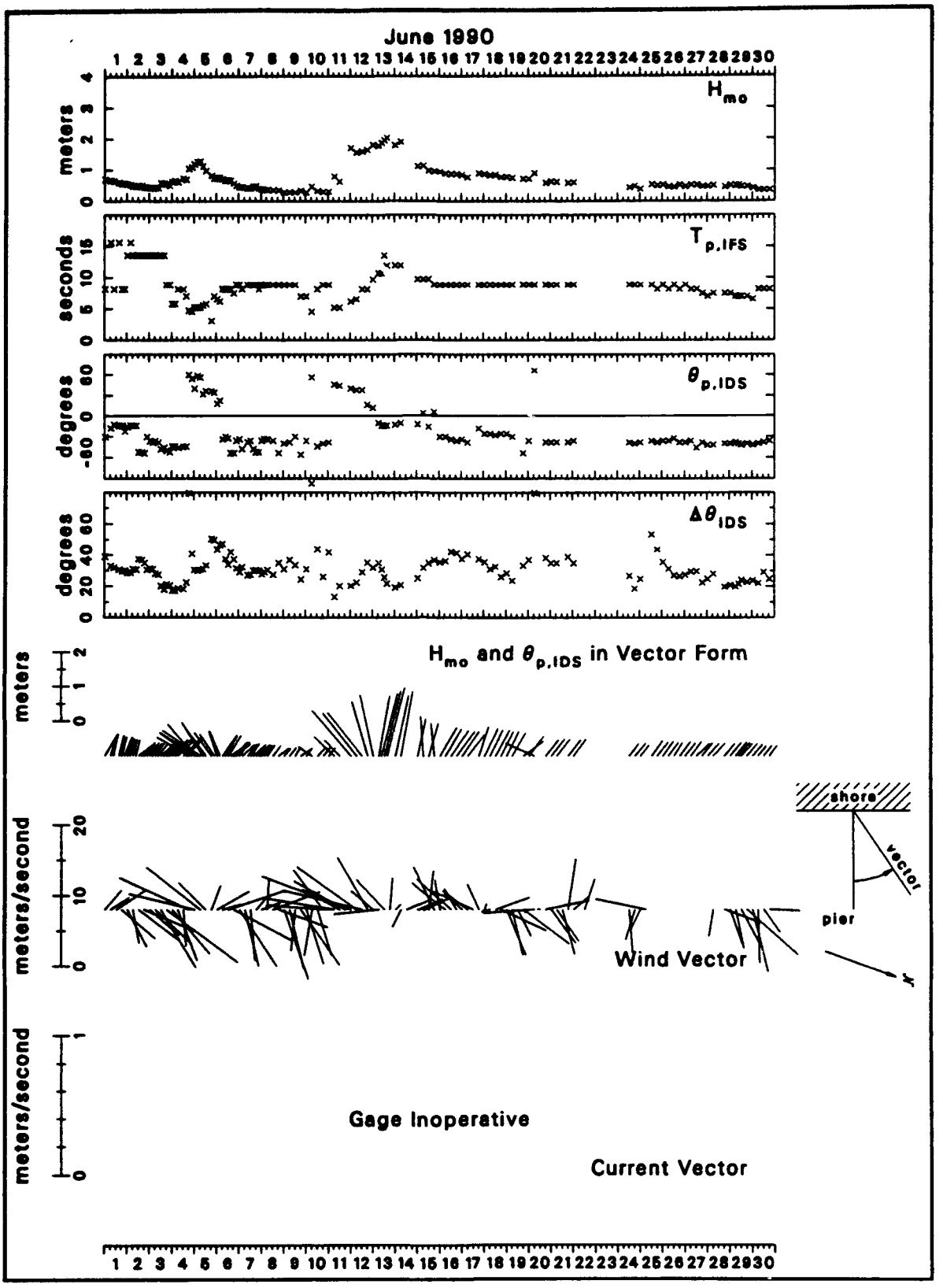


Figure B10. Bulk data for June 1990

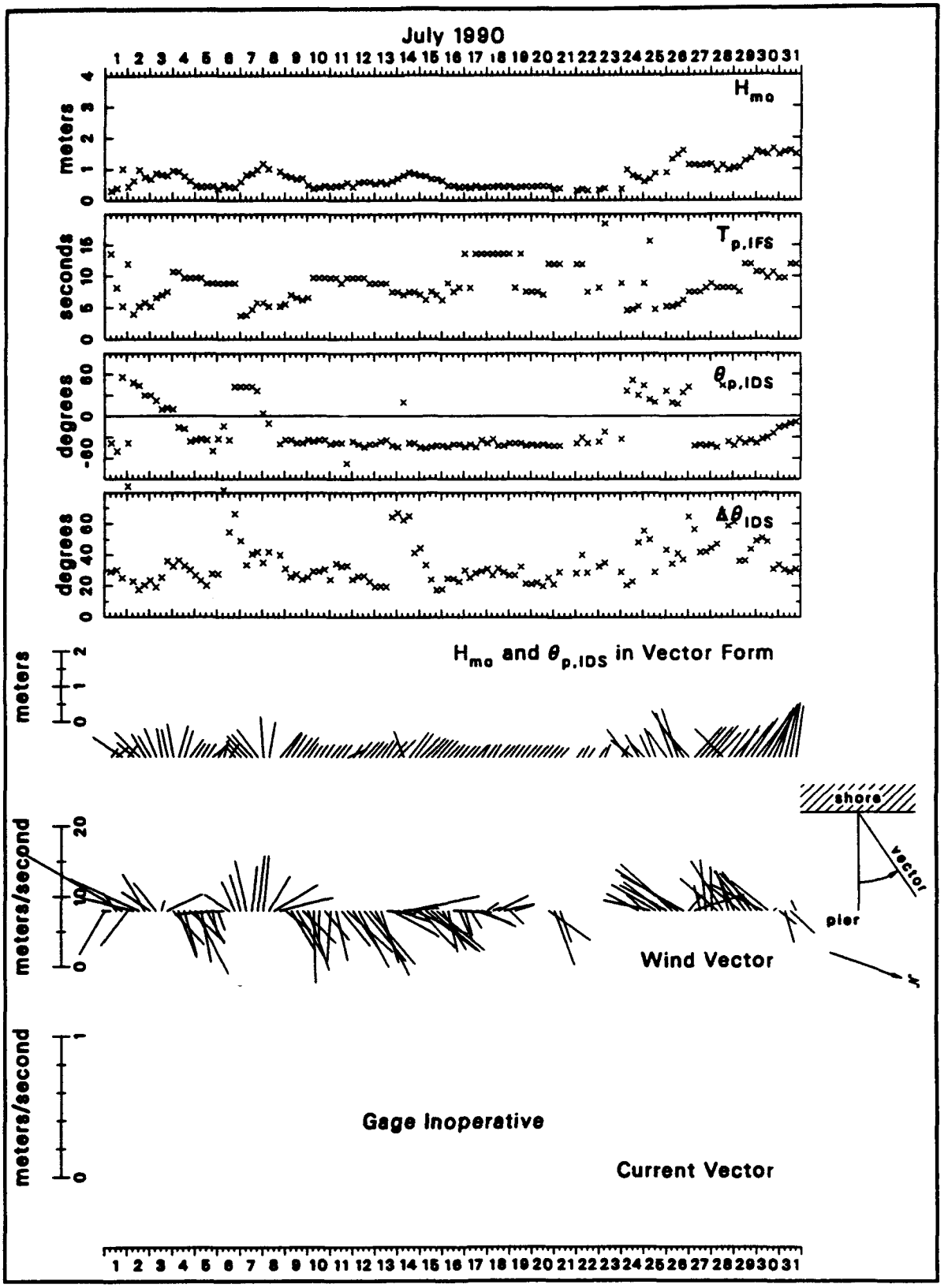


Figure B11. Bulk data for July 1990

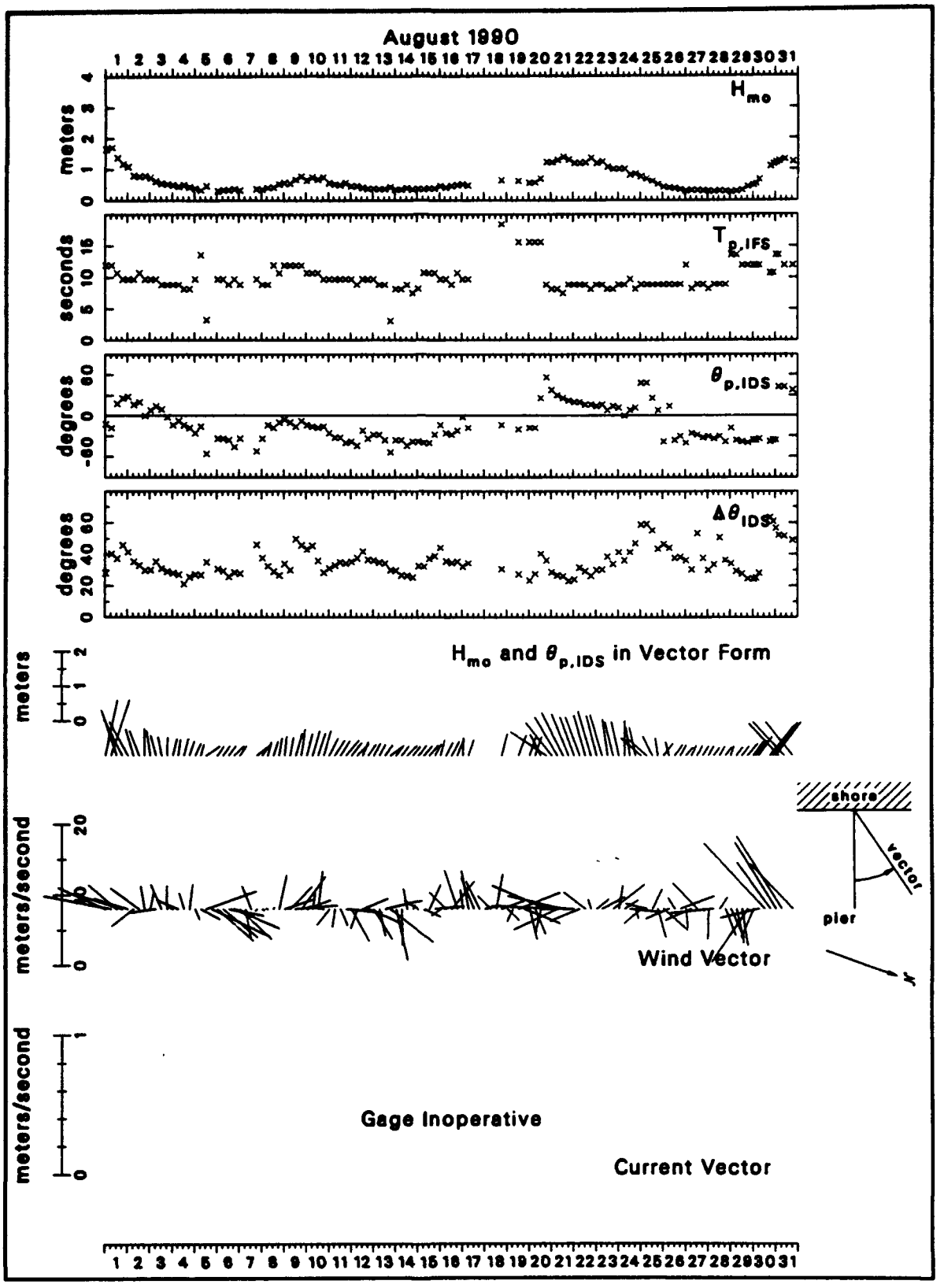
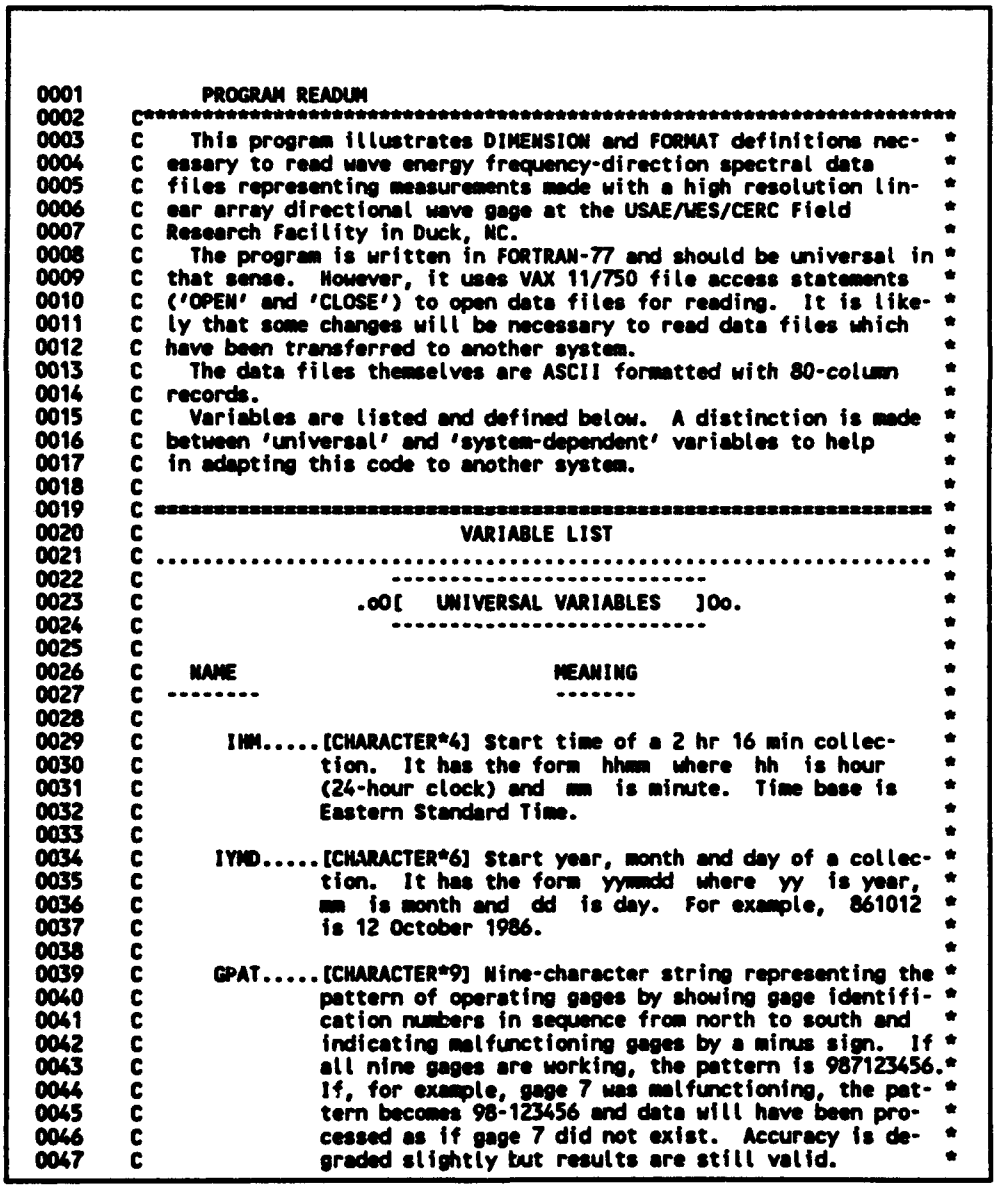


Figure B12. Bulk data for August 1990

Appendix C
Listing of FORTRAN Computer Program



```
0001          PROGRAM READUM
0002     C*************************************************************************
0003     C    This program illustrates DIMENSION and FORMAT definitions nec-      *
0004     C  essary to read wave energy frequency-direction spectral data          *
0005     C  files representing measurements made with a high resolution lin-      *
0006     C  ear array directional wave gage at the USAE/WES/CERC Field            *
0007     C  Research Facility in Duck, NC.                                        *
0008     C    The program is written in FORTRAN-77 and should be universal in     *
0009     C  that sense.  However, it uses VAX 11/750 file access statements      *
0010     C  ('OPEN' and 'CLOSE') to open data files for reading.  It is like-     *
0011     C  ly that some changes will be necessary to read data files which       *
0012     C  have been transferred to another system.                              *
0013     C    The data files themselves are ASCII formatted with 80-column        *
0014     C  records.                                                              *
0015     C    Variables are listed and defined below.  A distinction is made      *
0016     C  between 'universal' and 'system-dependent' variables to help          *
0017     C  in adapting this code to another system.                              *
0018     C                                                                        *
0019     C ======================================================================= *
0020     C                          VARIABLE LIST                                 *
0021     C ----------------------------------------------------------------------- *
0022     C                        -------------------------                       *
0023     C                    .oO[   UNIVERSAL VARIABLES   ]Oo.                   *
0024     C                        -------------------------                       *
0025     C                                                                        *
0026     C    NAME                              MEANING                         *
0027     C  --------                            -------                         *
0028     C                                                                        *
0029     C       IHM.....[CHARACTER*4] Start time of a 2 hr 16 min collec-        *
0030     C               tion.  It has the form  hhmm  where  hh  is hour         *
0031     C               (24-hour clock) and  mm  is minute.  Time base is        *
0032     C               Eastern Standard Time.                                   *
0033     C                                                                        *
0034     C       IYMD....[CHARACTER*6] Start year, month and day of a collec-     *
0035     C               tion.  It has the form  yymmdd  where  yy  is year,      *
0036     C               mm  is month and  dd  is day.  For example,  861012      *
0037     C               is 12 October 1986.                                      *
0038     C                                                                        *
0039     C       GPAT....[CHARACTER*9] Nine-character string representing the     *
0040     C               pattern of operating gages by showing gage identifi-     *
0041     C               cation numbers in sequence from north to south and       *
0042     C               indicating malfunctioning gages by a minus sign.  If     *
0043     C               all nine gages are working, the pattern is 987123456.    *
0044     C               If, for example, gage 7 was malfunctioning, the pat-     *
0045     C               tern becomes 98-123456 and data will have been pro-      *
0046     C               cessed as if gage 7 did not exist.  Accuracy is de-      *
0047     C               graded slightly but results are still valid.             *
```

Figure C1. Listing of FORTRAN Computer Program (Sheet 1 of 3)

```
0048    C                                                                *
0049    C     DEPTH.....[REAL, in meters] Mean total water depth at the lin- *
0050    C               ear array during a 2 hr 16 min collection.       *
0051    C                                                                *
0052    C       NF.....[INTEGER] Number of frequency bands in the discrete *
0053    C               spectral representations.                        *
0054    C                                                                *
0055    C       ND.....[INTEGER] Number of direction bands in the discrete *
0056    C               spectral representations.                        *
0057    C                                                                *
0058    C      D(J).....[REAL, in degrees] J'th element of array represent- *
0059    C               ing wave direction, which is the direction from  *
0060    C               which waves are coming counterclockwise from shore *
0061    C               normal;  0.0 degrees is shore normal, positive   *
0062    C               angles are for waves from the northeast quadrant, *
0063    C               negative angles are for southeast quadrant.  Direc- *
0064    C               tions are considered to reside in the centers of *
0065    C               discrete direction bands (or bins or arcs).      *
0066    C                                                                *
0067    C     DS(J).....[REAL, in meters squared per degree] J'th element *
0068    C               of array representing direction spectrum.  This is *
0069    C               the directional analogy of the frequency spectrum, *
0070    C               being the integral of the frequency-direction spec- *
0071    C               trum over all frequencies (in the analysis pass  *
0072    C               band) of sea surface displacement variance in each *
0073    C               direction band.                                  *
0074    C                                                                *
0075    C      F(N).....[REAL, in Hertz] N'th element of array representing *
0076    C               frequency.  Considered the center frequency of a *
0077    C               discrete frequency band.                         *
0078    C                                                                *
0079    C     FS(N).....[REAL, in meters squared per Hertz] N'th element of *
0080    C               array representing the frequency spectrum.  Here, it *
0081    C               is the integral of the frequency-direction spectrum *
0082    C               over all directions in each frequency band.  It is *
0083    C               the same as the conventional frequency spectrum that *
0084    C               one would get with a single time series.         *
0085    C                                                                *
0086    C   DD(N,J).....[REAL, in 1/degrees] Element at N'th frequency and *
0087    C               J'th direction of an entity known as the directional *
0088    C               distribution function.  It is defined as the ratio *
0089    C               of the frequency-direction spectrum to the frequency *
0090    C               spectrum at each frequency for all directions, i.e., *
0091    C                                                                *
0092    C                              DD(N,J) = FDS(N,J)/FS(N)          *
0093    C                                                                *
0094    C               The directional distribution is convenient in sever- *
0095    C               al ways for normalizing the frequency-direction  *
0096    C               spectrum, but note that it is physically meaningful *
0097    C               only for a fixed frequency (N = constant) since a *
0098    C               different normalizing factor is used at each fre- *
0099    C               quency.                                          *
0100    C                                                                *
0101    C  FDS(N,J).....[REAL, in meters squared per Hertz per degree] Fre- *
0102    C               quency-direction spectral density of sea surface *
0103    C               displacement at frequency F(N) and direction D(J). *
0104    C               It is determined from the input data by the compu- *
0105    C               tation of                                        *
0106    C                                                                *
0107    C                              FDS(N,J) = FS(N)*DD(N,J)          *
0108    C                                                                *
0109    C ***************************************************************** *
0110    C                                                                *
0111    C                    --------------------------------            *
0112    C                  .oO[   SYSTEM-DEPENDENT VARIABLES   ]Oo.      *
0113    C                    --------------------------------            *
0114    C                                                                *
0115    C  DATETIME.....[CHARACTER*10] Ten-character string requested of *
0116    C               default input device.  It contains year, month, day, *
0117    C               hour and minute in the form  yymmddhhmm  and is used *
0118    C               to form the name of an input file.               *
0119    C                                                                *
```

Figure C1. (Sheet 2 of 3)

```
C  DATAFILE.....[CHARACTER*16] String representing input file name   *
C               in an 'OPEN' statement.                               *
C                                                                     *
C*********************************************STIMPSON T. CAT, JAN93******
      CHARACTER*4          IHM
      CHARACTER*6          IYMD
      CHARACTER*9          GPAT
      CHARACTER*10     DATETIME
      CHARACTER*16     DATAFILE
      DIMENSION          F(28),      FS(28),     D(91),     DS(91)
      DIMENSION       DD(28,91),   FDS(28,91)
C*********************************************************************
C  SET GENERIC DATAFILE NAME, GET SPECIFIC DATE AND TIME FROM USER    *
C  AND SET SPECIFIC DATAFILE NAME.                                    *
C*********************************************************************
      DATAFILE='FDyymmddhhmm.DAT'                  !GENERIC FILE NAME
      WRITE(*,'(1X,
     1   ''Enter Date/Time Code (yymmddhhmm)....: '',
     2   $)')                                      !PROMPT USER
      READ(*,'(A)') DATETIME                       !GET USER RESPONSE
      DATAFILE(3:12)=DATETIME                      !SET FILE NAME
C*********************************************************************
C  OPEN DATA FILE, READ FORMATTED DATA AND CLOSE DATA FILE.  NOTE:    *
C  THE VARIABLE 'NN' IS THE FREQUENCY INDEX WHICH HAS BEEN WRITTEN    *
C  TO THE DATA FILE TO MAKE IT EASY TO READ THE FILE BY HAND.  HERE   *
C  IT IS NOT NEEDED SO IT IS READ TO A DUMMY VARIABLE.                *
C*********************************************************************
      OPEN(10,FILE=DATAFILE,STATUS='OLD',
     1   FORM='FORMATTED',RECL=80)                 !VAX 'OPEN' STATEMENT
      READ(10,101) IYMD,IHM,GPAT,DEPTH,NF,ND       !AUX. PARAMETERS
      READ(10,102) (D(J),J=1,ND)                   !DIRECTIONS
      READ(10,103) (DS(J),J=1,ND)                  !DIRECTIONAL SPECTRUM
      DO 1 N=1,NF                                  !FOR ALL FREQ.'S
        READ(10,104) NN,F(N),FS(N)                 !FREQ. & FREQ. SPECT.
        READ(10,105) (DD(N,J),J=1,ND)              !DIR. DISTRIBUTION
    1 CONTINUE                                     !END FREQ. LOOP
      CLOSE(10)                                    !VAX 'CLOSE'
C*********************************************************************
C  FORMAT STATEMENTS:                                                 *
C*********************************************************************
  101 FORMAT(1X,A6,A4,1X,A9,1X,F6.2,1X,I2,1X,I2)
  102 FORMAT(13(1X,F5.1))
  103 FORMAT(5(1X,E14.7))
  104 FORMAT(1X,I2,1X,F9.6,1X,E14.7)
  105 FORMAT(8(1X,F9.6))
C*********************************************************************
C  BUILD FREQUENCY-DIRECTION SPECTRUM FROM DIRECTIONAL DISTRIBUTION   *
C  ARRAY AND FREQUENCY SPECTRUM.                                      *
C*********************************************************************
      DO 2 N=1,NF                                  !FOR ALL FREQ.'S
        DO 3 J=1,ND                                !FOR ALL DIR.'S
          FDS(N,J)=FS(N)*DD(N,J)                   !SET F-D SPECTRUM
    3   CONTINUE                                   !END DIR. LOOP
    2 CONTINUE                                     !END FREQ. LOOP
C*********************************************************************
C  AT THIS POINT YOU SHOULD HAVE ALL THE DATA THERE IS.  INSERT YOUR  *
C  OWN CODE HERE...                                                   *
C*********************************************************************
C*********************************************************************
C  END PROGRAM.                                                       *
C*********************************************************************
      END                                          !BAG IT
```

Figure C1. (Sheet 3 of 3)

Appendix D
Listing of Sample Data File

```
8912241300 987123456   8.07 28 91
 90.0  88.0  86.0  84.0  82.0  80.0  78.0  76.0  74.0  72.0  70.0  68.0  66.0
 64.0  62.0  60.0  58.0  56.0  54.0  52.0  50.0  48.0  46.0  44.0  42.0  40.0
 38.0  36.0  34.0  32.0  30.0  28.0  26.0  24.0  22.0  20.0  18.0  16.0  14.0
 12.0  10.0   8.0   6.0   4.0   2.0   0.0  -2.0  -4.0  -6.0  -8.0 -10.0 -12.0
-14.0 -16.0 -18.0 -20.0 -22.0 -24.0 -26.0 -28.0 -30.0 -32.0 -34.0 -36.0 -38.0
-40.0 -42.0 -44.0 -46.0 -48.0 -50.0 -52.0 -54.0 -56.0 -58.0 -60.0 -62.0 -64.0
-66.0 -68.0 -70.0 -72.0 -74.0 -76.0 -78.0 -80.0 -82.0 -84.0 -86.0 -88.0 -90.0
 0.1957904E-05  0.1921361E-04  0.3708406E-04  0.5762637E-04  0.7939069E-04
 0.1028028E-03  0.1293817E-03  0.1606400E-03  0.1966464E-03  0.2412888E-03
 0.2939743E-03  0.3598202E-03  0.4545026E-03  0.5643208E-03  0.7190707E-03
 0.9318583E-03  0.1227279E-02  0.1662588E-02  0.2279115E-02  0.3204539E-02
 0.4596625E-02  0.6593220E-02  0.9372327E-02  0.1304245E-01  0.1687013E-01
 0.1909113E-01  0.1781560E-01  0.1535409E-01  0.1385275E-01  0.1326852E-01
 0.1341582E-01  0.1429450E-01  0.1574177E-01  0.1731270E-01  0.1898762E-01
 0.2029633E-01  0.2135240E-01  0.2238381E-01  0.2320133E-01  0.2394978E-01
 0.2419497E-01  0.2394120E-01  0.2407507E-01  0.2468970E-01  0.2516885E-01
 0.2449605E-01  0.2217653E-01  0.1927662E-01  0.1704288E-01  0.1528069E-01
 0.1388841E-01  0.1255725E-01  0.1139252E-01  0.1023336E-01  0.9313131E-02
 0.8548738E-02  0.7856965E-02  0.7128316E-02  0.6589629E-02  0.5988174E-02
 0.5350271E-02  0.4748717E-02  0.4114332E-02  0.3552550E-02  0.3070204E-02
 0.2595729E-02  0.2230464E-02  0.1949933E-02  0.1605858E-02  0.1408403E-02
 0.1199629E-02  0.1020363E-02  0.8792977E-03  0.7586587E-03  0.6481631E-03
 0.5565993E-03  0.4760272E-03  0.4067405E-03  0.3542215E-03  0.2985263E-03
 0.2582629E-03  0.2230107E-03  0.1899755E-03  0.1607006E-03  0.1331593E-03
 0.1090118E-03  0.8490428E-04  0.6328860E-04  0.4041480E-04  0.2167964E-04
 0.1604486E-05
 1  0.054200  0.9427561E+00
 0.000000  0.000037  0.000086  0.000113  0.000181  0.000201  0.000320  0.000320
 0.000467  0.000467  0.000653  0.000684  0.000921  0.001015  0.001282  0.001482
 0.001733  0.002067  0.002250  0.002708  0.002798  0.003338  0.003338  0.003745
 0.003745  0.003995  0.004037  0.004272  0.004366  0.004604  0.004781  0.004949
 0.005174  0.005207  0.005291  0.005263  0.005093  0.005093  0.004873  0.004873
 0.005065  0.005097  0.006123  0.006533  0.008795  0.010492  0.013980  0.018630
 0.021358  0.028177  0.028039  0.027213  0.027213  0.019194  0.019194  0.014181
 0.013345  0.011508  0.010773  0.010082  0.009564  0.009055  0.008377  0.007903
 0.006719  0.006479  0.005042  0.005042  0.003691  0.003691  0.002819  0.002674
 0.002245  0.002074  0.001830  0.001646  0.001508  0.001323  0.001246  0.001055
 0.001022  0.000820  0.000820  0.000607  0.000607  0.000419  0.000387  0.000248
 0.000192  0.000082  0.000000
 2  0.063960  0.3823972E+01
 0.000000  0.000023  0.000038  0.000072  0.000080  0.000124  0.000133  0.000169
 0.000191  0.000225  0.000267  0.000295  0.000363  0.000380  0.000493  0.000524
 0.000649  0.000738  0.000871  0.001023  0.001124  0.001383  0.001448  0.001735
 0.001785  0.001982  0.002062  0.002182  0.002315  0.002403  0.002715  0.002793
 0.003501  0.003728  0.004636  0.005221  0.006099  0.006856  0.007361  0.007947
 0.008094  0.008608  0.008832  0.009728  0.010891  0.012635  0.015710  0.017760
 0.022794  0.024052  0.025637  0.025031  0.022607  0.021197  0.019084  0.018290
```

Figure D1. Listing of Sample Data File (Sheet 1 of 6)

```
0.017761  0.017526  0.017468  0.015973  0.015236  0.012289  0.010626  0.008132
0.006209  0.004927  0.003506  0.003151  0.002217  0.002105  0.001656  0.001544
0.001376  0.001263  0.001187  0.001080  0.001053  0.000935  0.000911  0.000814
0.000762  0.000685  0.000602  0.000547  0.000438  0.000411  0.000271  0.000243
0.000133  0.000080  0.000000
3  0.073730  0.1082754E+02
0.000000  0.000021  0.000036  0.000065  0.000087  0.000103  0.000136  0.000165
0.000192  0.000246  0.000278  0.000321  0.000406  0.000460  0.000550  0.000679
0.000766  0.000941  0.001140  0.001283  0.001619  0.001860  0.002056  0.002521
0.002742  0.003013  0.003404  0.003601  0.003889  0.004293  0.004565  0.005087
0.005768  0.006263  0.007448  0.008469  0.009257  0.011121  0.011886  0.012705
0.013633  0.013905  0.014237  0.014610  0.014852  0.015282  0.015837  0.016174
0.016778  0.016979  0.017098  0.017044  0.016912  0.016788  0.016565  0.016420
0.016226  0.015535  0.014888  0.013695  0.011739  0.010535  0.008304  0.006730
0.005719  0.004133  0.003428  0.002855  0.002077  0.001834  0.001535  0.001201
0.001071  0.000897  0.000752  0.000680  0.000573  0.000497  0.000451  0.000375
0.000334  0.000302  0.000244  0.000216  0.000185  0.000141  0.000120  0.000091
0.000052  0.000032  0.000000
4  0.083500  0.1221970E+02
0.000000  0.000010  0.000019  0.000028  0.000044  0.000054  0.000067  0.000082
0.000104  0.000130  0.000158  0.000194  0.000258  0.000323  0.000400  0.000531
0.000741  0.000977  0.001253  0.001740  0.002295  0.002761  0.003212  0.003777
0.003899  0.003972  0.003981  0.004020  0.004180  0.004441  0.005027  0.006104
0.007261  0.008587  0.010843  0.012459  0.013508  0.014283  0.014541  0.014587
0.014746  0.015103  0.016076  0.016936  0.017772  0.018681  0.019127  0.019291
0.019370  0.019370  0.019266  0.018953  0.018473  0.016572  0.014831  0.013068
0.011017  0.008877  0.007708  0.006682  0.005644  0.004837  0.004270  0.003735
0.003036  0.002544  0.002160  0.001809  0.001345  0.001155  0.000981  0.000807
0.000667  0.000586  0.000514  0.000443  0.000390  0.000354  0.000320  0.000279
0.000250  0.000226  0.000201  0.000167  0.000145  0.000123  0.000099  0.000069
0.000048  0.000027  0.000000
5  0.093260  0.1709006E+02
0.000000  0.000010  0.000018  0.000028  0.000039  0.000051  0.000064  0.000085
0.000104  0.000127  0.000155  0.000195  0.000259  0.000328  0.000422  0.000544
0.000699  0.000935  0.001232  0.001625  0.002063  0.002571  0.003218  0.004070
0.004795  0.005547  0.006310  0.007082  0.007989  0.009167  0.010438  0.011939
0.013627  0.015428  0.017401  0.018417  0.018695  0.018476  0.017912  0.017190
0.016494  0.016276  0.016300  0.016493  0.016763  0.016945  0.016766  0.016176
0.015316  0.014267  0.013113  0.011637  0.010546  0.009570  0.008659  0.007796
0.006895  0.005949  0.005248  0.004619  0.004069  0.003603  0.003174  0.002866
0.002636  0.002431  0.002242  0.002061  0.001829  0.001625  0.001439  0.001253
0.001064  0.000891  0.000728  0.000605  0.000497  0.000406  0.000333  0.000258
0.000207  0.000170  0.000140  0.000114  0.000085  0.000067  0.000051  0.000036
0.000023  0.000012  0.000000
6  0.103030  0.8828883E+01
0.000000  0.000026  0.000051  0.000076  0.000101  0.000141  0.000177  0.000224
0.000280  0.000341  0.000425  0.000533  0.000656  0.000809  0.000997  0.001237
0.001554  0.001922  0.002340  0.002867  0.003491  0.004225  0.005073  0.006079
0.007219  0.008434  0.009737  0.011074  0.012375  0.013552  0.014694  0.015777
0.016833  0.017874  0.018805  0.019415  0.019566  0.019142  0.018192  0.016900
0.015543  0.014427  0.013658  0.013291  0.013269  0.013441  0.013456  0.012994
0.011944  0.010494  0.008886  0.007340  0.006067  0.005123  0.004466  0.004060
0.003862  0.003833  0.003924  0.004078  0.004234  0.004305  0.004248  0.004054
0.003756  0.003398  0.003019  0.002631  0.002264  0.001934  0.001633  0.001364
0.001128  0.000934  0.000759  0.000606  0.000489  0.000396  0.000321  0.000260
0.000208  0.000166  0.000136  0.000109  0.000086  0.000069  0.000049  0.000037
0.000025  0.000013  0.000000
7  0.112790  0.7227827E+01
0.000000  0.000020  0.000041  0.000061  0.000086  0.000109  0.000134  0.000164
0.000195  0.000231  0.000279  0.000332  0.000397  0.000480  0.000589  0.000731
0.000933  0.001222  0.001598  0.002166  0.002963  0.004085  0.005626  0.007531
0.009846  0.012177  0.014110  0.015397  0.015988  0.016145  0.016248  0.016600
0.017345  0.018426  0.019614  0.020522  0.020761  0.020058  0.018597  0.016715
0.014731  0.012893  0.011405  0.010215  0.009252  0.008556  0.008040  0.007664
0.007429  0.007293  0.007234  0.007228  0.007232  0.007202  0.007089  0.006867
0.006540  0.006135  0.005695  0.005257  0.004845  0.004459  0.004090  0.003720
0.003339  0.002946  0.002542  0.002144  0.001788  0.001458  0.001181  0.000948
0.000759  0.000616  0.000494  0.000400  0.000330  0.000273  0.000227  0.000191
0.000161  0.000134  0.000113  0.000096  0.000078  0.000064  0.000050  0.000036
0.000024  0.000012  0.000000
8  0.122560  0.4972415E+01
0.000002  0.000020  0.000039  0.000060  0.000081  0.000102  0.000128  0.000152
```

Figure D1. (Sheet 2 of 6)

```
 0.000187  0.000220  0.000258  0.000306  0.000366  0.000439  0.000534  0.000677
 0.000874  0.001132  0.001523  0.002082  0.002874  0.003938  0.005411  0.007250
 0.009856  0.010576  0.011590  0.012137  0.012408  0.012712  0.013382  0.014581
 0.016161  0.017891  0.019336  0.020049  0.019820  0.018767  0.017134  0.015747
 0.014631  0.013837  0.013358  0.013090  0.012903  0.012649  0.012181  0.011448
 0.010521  0.009484  0.008462  0.007596  0.006938  0.006481  0.006311  0.006301
 0.006361  0.006381  0.006255  0.005927  0.005382  0.004733  0.004125  0.003585
 0.003128  0.002748  0.002418  0.002123  0.001834  0.001575  0.001339  0.001120
 0.000921  0.000749  0.000610  0.000488  0.000388  0.000317  0.000260  0.000213
 0.000176  0.000148  0.000123  0.000099  0.000083  0.000065  0.000052  0.000038
 0.000025  0.000013  0.000001
 9  0.132320  0.4919389E+01
 0.000003  0.000018  0.000034  0.000051  0.000073  0.000093  0.000116  0.000141
 0.000171  0.000213  0.000256  0.000311  0.000388  0.000505  0.000651  0.000851
 0.001132  0.001581  0.002170  0.002911  0.003962  0.005379  0.006994  0.008785
 0.010989  0.013902  0.016689  0.019217  0.020638  0.020021  0.017817  0.015224
 0.013058  0.011737  0.011778  0.013038  0.015480  0.019142  0.021929  0.021954
 0.019206  0.014709  0.010996  0.008756  0.007445  0.006825  0.006661  0.006681
 0.006723  0.006756  0.006853  0.007095  0.007546  0.008196  0.008787  0.008879
 0.008348  0.007205  0.005781  0.004716  0.003951  0.003460  0.003169  0.003037
 0.002928  0.002777  0.002501  0.002165  0.001805  0.001429  0.001076  0.000812
 0.000627  0.000481  0.000370  0.000299  0.000248  0.000210  0.000178  0.000156
 0.000139  0.000124  0.000108  0.000095  0.000082  0.000069  0.000055  0.000041
 0.000028  0.000015  0.000002
10  0.142090  0.4837725E+01
 0.000004  0.000023  0.000046  0.000072  0.000097  0.000127  0.000161  0.000201
 0.000243  0.000303  0.000360  0.000439  0.000543  0.000653  0.000804  0.001011
 0.001255  0.001614  0.002112  0.002732  0.003836  0.005210  0.006992  0.009886
 0.012540  0.015090  0.016968  0.017380  0.016985  0.016215  0.015643  0.015359
 0.015435  0.015697  0.015976  0.015982  0.015659  0.014920  0.014152  0.013381
 0.012657  0.012166  0.011707  0.011234  0.010791  0.010315  0.009899  0.009601
 0.009343  0.009091  0.008772  0.008227  0.007631  0.007048  0.006492  0.006214
 0.006129  0.006220  0.006338  0.006311  0.005949  0.005312  0.004397  0.003526
 0.002832  0.002193  0.001793  0.001511  0.001265  0.001121  0.001004  0.000895
 0.000815  0.000734  0.000655  0.000587  0.000514  0.000450  0.000396  0.000338
 0.000290  0.000252  0.000209  0.000177  0.000146  0.000117  0.000091  0.000068
 0.000044  0.000022  0.000004
11  0.151860  0.4872071E+01
 0.000005  0.000022  0.000043  0.000065  0.000092  0.000122  0.000156  0.000201
 0.000251  0.000321  0.000403  0.000522  0.000661  0.000870  0.001137  0.001516
 0.002054  0.002798  0.003853  0.005176  0.006999  0.008733  0.010609  0.011635
 0.012099  0.011950  0.011502  0.011074  0.010749  0.010653  0.010795  0.011165
 0.011746  0.012574  0.013477  0.014607  0.015601  0.016735  0.017475  0.018013
 0.018050  0.017550  0.016646  0.015307  0.013874  0.012415  0.011098  0.010026
 0.009134  0.008528  0.008059  0.007798  0.007605  0.007490  0.007317  0.007091
 0.006677  0.006173  0.005498  0.004826  0.004152  0.003539  0.003026  0.002563
 0.002221  0.001905  0.001682  0.001457  0.001304  0.001142  0.001025  0.000903
 0.000804  0.000708  0.000624  0.000545  0.000474  0.000413  0.000353  0.000306
 0.000258  0.000220  0.000183  0.000154  0.000124  0.000101  0.000077  0.000056
 0.000037  0.000019  0.000004
12  0.161620  0.4881656E+01
 0.000003  0.000013  0.000028  0.000042  0.000058  0.000077  0.000098  0.000125
 0.000155  0.000194  0.000245  0.000306  0.000394  0.000500  0.000661  0.000868
 0.001148  0.001613  0.002157  0.003078  0.004245  0.005762  0.007736  0.009607
 0.011349  0.012239  0.012347  0.011702  0.010818  0.009814  0.009045  0.008485
 0.008152  0.008076  0.008237  0.008640  0.009290  0.010378  0.011755  0.013857
 0.016565  0.019862  0.023968  0.027296  0.029437  0.028851  0.026043  0.021549
 0.017502  0.013605  0.010903  0.008820  0.007237  0.006160  0.005219  0.004526
 0.003930  0.003367  0.002931  0.002497  0.002147  0.001840  0.001559  0.001345
 0.001142  0.000990  0.000861  0.000747  0.000663  0.000586  0.000527  0.000477
 0.000430  0.000395  0.000358  0.000327  0.000299  0.000269  0.000244  0.000218
 0.000194  0.000171  0.000148  0.000128  0.000107  0.000088  0.000070  0.000051
 0.000035  0.000016  0.000004
13  0.171390  0.4202547E+01
 0.000002  0.000008  0.000017  0.000026  0.000036  0.000047  0.000062  0.000079
 0.000099  0.000128  0.000165  0.000220  0.000292  0.000401  0.000572  0.000830
 0.001236  0.001895  0.003014  0.004614  0.006839  0.009748  0.012046  0.013052
 0.012472  0.010758  0.009058  0.007805  0.007111  0.007022  0.007461  0.008366
 0.009797  0.011548  0.013324  0.014939  0.016229  0.017064  0.017892  0.019146
 0.021506  0.024695  0.027955  0.029573  0.027293  0.022169  0.016361  0.011343
 0.008078  0.006131  0.004975  0.004321  0.004050  0.003956  0.003945  0.003922
 0.003806  0.003568  0.003198  0.002740  0.002297  0.001893  0.001539  0.001276
```

Figure D1. (Sheet 3 of 6)

```
 0.001088  0.000956  0.000867  0.000821  0.000800  0.000796  0.000804  0.000810
 0.000809  0.000795  0.000762  0.000715  0.000656  0.000585  0.000514  0.000446
 0.000380  0.000319  0.000264  0.000219  0.000178  0.000139  0.000108  0.000078
 0.000051  0.000025  0.000006
14  0.181150  0.4366933E+01
 0.000002  0.000009  0.000018  0.000027  0.000040  0.000052  0.000067  0.000085
 0.000109  0.000139  0.000177  0.000230  0.000308  0.000413  0.000566  0.000803
 0.001154  0.001711  0.002591  0.004092  0.006395  0.009687  0.013691  0.017240
 0.018787  0.017734  0.015060  0.012203  0.010094  0.008846  0.008356  0.008544
 0.009393  0.010936  0.013186  0.015759  0.018048  0.019309  0.019168  0.017941
 0.016440  0.015381  0.015357  0.016561  0.018781  0.021147  0.021922  0.019822
 0.015386  0.010608  0.007005  0.004755  0.003380  0.002594  0.002149  0.001919
 0.001828  0.001832  0.001892  0.001967  0.002018  0.002002  0.001893  0.001689
 0.001420  0.001148  0.000905  0.000713  0.000568  0.000464  0.000391  0.000339
 0.000302  0.000276  0.000256  0.000239  0.000224  0.000209  0.000194  0.000178
 0.000162  0.000145  0.000129  0.000112  0.000095  0.000078  0.000062  0.000045
 0.000030  0.000015  0.000004
15  0.190920  0.3873916E+01
 0.000002  0.000006  0.000012  0.000019  0.000026  0.000035  0.000045  0.000058
 0.000074  0.000094  0.000123  0.000161  0.000215  0.000296  0.000417  0.000603
 0.000907  0.001394  0.002218  0.003558  0.005683  0.008747  0.012435  0.015629
 0.017040  0.016349  0.014530  0.012648  0.011215  0.010322  0.009843  0.009625
 0.009560  0.009611  0.009822  0.010327  0.011354  0.013191  0.016208  0.020402
 0.025019  0.027912  0.027279  0.023541  0.019063  0.015562  0.013627  0.013045
 0.013288  0.013504  0.012719  0.010543  0.007684  0.005054  0.003185  0.001996
 0.001300  0.000901  0.000673  0.000545  0.000482  0.000462  0.000473  0.000510
 0.000561  0.000615  0.000656  0.000665  0.000639  0.000583  0.000508  0.000431
 0.000359  0.000298  0.000248  0.000207  0.000175  0.000150  0.000129  0.000111
 0.000097  0.000084  0.000072  0.000062  0.000052  0.000043  0.000034  0.000025
 0.000017  0.000008  0.000002
16  0.200680  0.3308356E+01
 0.000001  0.000004  0.000009  0.000014  0.000019  0.000025  0.000032  0.000041
 0.000051  0.000064  0.000083  0.000106  0.000139  0.000185  0.000252  0.000350
 0.000501  0.000744  0.001120  0.001717  0.002668  0.004141  0.006305  0.009374
 0.012709  0.015667  0.017319  0.017349  0.016257  0.014856  0.013836  0.013478
 0.013798  0.014719  0.016101  0.017686  0.019214  0.020329  0.020978  0.021278
 0.021477  0.021797  0.022272  0.022533  0.021976  0.020096  0.016948  0.013241
 0.009714  0.006869  0.004912  0.003578  0.002713  0.002156  0.001801  0.001576
 0.001443  0.001359  0.001299  0.001241  0.001168  0.001069  0.000944  0.000806
 0.000666  0.000537  0.000426  0.000337  0.000263  0.000209  0.000169  0.000138
 0.000114  0.000096  0.000081  0.000070  0.000061  0.000053  0.000046  0.000041
 0.000036  0.000031  0.000027  0.000023  0.000019  0.000016  0.000012  0.000009
 0.000006  0.000003  0.000001
17  0.210450  0.2696900E+01
 0.000005  0.000019  0.000038  0.000058  0.000080  0.000107  0.000137  0.000172
 0.000218  0.000272  0.000341  0.000434  0.000554  0.000708  0.000933  0.001231
 0.001623  0.002228  0.003007  0.004068  0.005568  0.007359  0.009431  0.011638
 0.013324  0.014284  0.014341  0.013679  0.012718  0.011724  0.011055  0.010762
 0.010946  0.011643  0.012906  0.014954  0.017512  0.020527  0.023611  0.025655
 0.026142  0.024804  0.022326  0.019504  0.016770  0.014674  0.013022  0.011596
 0.010371  0.009129  0.007751  0.006428  0.005154  0.003972  0.003050  0.002336
 0.001773  0.001397  0.001131  0.000935  0.000810  0.000722  0.000657  0.000612
 0.000575  0.000540  0.000506  0.000471  0.000429  0.000388  0.000345  0.000300
 0.000260  0.000222  0.000186  0.000157  0.000132  0.000109  0.000091  0.000075
 0.000062  0.000051  0.000042  0.000034  0.000028  0.000022  0.000017  0.000012
 0.000008  0.000004  0.000001
18  0.220210  0.2722071E+01
 0.000004  0.000016  0.000032  0.000049  0.000066  0.000085  0.000105  0.000127
 0.000151  0.000181  0.000215  0.000259  0.000312  0.000388  0.000487  0.000637
 0.000850  0.001205  0.001747  0.002726  0.004272  0.007087  0.011094  0.016750
 0.021364  0.022874  0.020312  0.015618  0.011530  0.008575  0.007010  0.006342
 0.006504  0.007545  0.009628  0.013341  0.018774  0.025532  0.030924  0.032161
 0.028865  0.023700  0.019445  0.016816  0.015582  0.015029  0.014374  0.012983
 0.010691  0.008002  0.005513  0.003686  0.002460  0.001736  0.001316  0.001098
 0.000998  0.000979  0.001009  0.001060  0.001104  0.001109  0.001056  0.000950
 0.000799  0.000645  0.000495  0.000376  0.000276  0.000208  0.000154  0.000119
 0.000091  0.000072  0.000058  0.000047  0.000039  0.000033  0.000027  0.000023
 0.000020  0.000017  0.000014  0.000012  0.000010  0.000008  0.000006  0.000005
 0.000003  0.000001  0.000000
19  0.229980  0.2827127E+01
 0.000002  0.000008  0.000015  0.000023  0.000031  0.000039  0.000048  0.000058
 0.000069  0.000083  0.000100  0.000123  0.000154  0.000200  0.000272  0.000387
```

Figure D1. (Sheet 4 of 6)

```
 0.000583  0.000956  0.001650  0.003035  0.005975  0.011333  0.019421  0.027151
 0.027538  0.021125  0.013285  0.008344  0.005740  0.004577  0.004370  0.004890
 0.006280  0.008947  0.013142  0.018837  0.024388  0.026622  0.024806  0.020715
 0.017330  0.015671  0.015913  0.017821  0.020470  0.022122  0.020620  0.016312
 0.011281  0.007301  0.004857  0.003425  0.002614  0.002194  0.001963  0.001834
 0.001747  0.001657  0.001535  0.001378  0.001203  0.001021  0.000848  0.000701
 0.000574  0.000466  0.000380  0.000308  0.000246  0.000196  0.000155  0.000121
 0.000094  0.000073  0.000056  0.000043  0.000033  0.000026  0.000020  0.000016
 0.000012  0.000010  0.000008  0.000006  0.000005  0.000004  0.000003  0.000002
 0.000001  0.000001  0.000000
20  0.239750  0.2926732E+01
 0.000003  0.000012  0.000025  0.000037  0.000049  0.000062  0.000074  0.000088
 0.000102  0.000117  0.000134  0.000153  0.000178  0.000211  0.000256  0.000322
 0.000426  0.000595  0.000895  0.001454  0.002552  0.004747  0.009031  0.016101
 0.024110  0.027387  0.023244  0.016065  0.010691  0.007770  0.006548  0.006474
 0.007330  0.009088  0.011672  0.014553  0.016780  0.017336  0.016331  0.014807
 0.013945  0.014639  0.017775  0.024270  0.033241  0.038355  0.032531  0.020880
 0.011668  0.006551  0.004026  0.002778  0.002121  0.001741  0.001477  0.001254
 0.001045  0.000842  0.000660  0.000506  0.000385  0.000295  0.000228  0.000180
 0.000144  0.000118  0.000097  0.000080  0.000066  0.000055  0.000045  0.000036
 0.000029  0.000024  0.000019  0.000015  0.000013  0.000010  0.000008  0.000007
 0.000006  0.000005  0.000004  0.000003  0.000003  0.000002  0.000002  0.000001
 0.000001  0.000000  0.000000
21  0.249510  0.2994039E+01
 0.000002  0.000010  0.000021  0.000032  0.000044  0.000058  0.000074  0.000093
 0.000116  0.000146  0.000186  0.000237  0.000311  0.000414  0.000568  0.000806
 0.001178  0.001790  0.002824  0.004569  0.007397  0.011628  0.016779  0.021137
 0.022524  0.020688  0.017504  0.014715  0.013085  0.012548  0.012858  0.013703
 0.014687  0.015391  0.015544  0.015176  0.014617  0.014310  0.014638  0.015842
 0.017917  0.020343  0.021883  0.021223  0.018314  0.014489  0.011182  0.008953
 0.007684  0.007068  0.006736  0.006311  0.005535  0.004422  0.003222  0.002188
 0.001427  0.000915  0.000587  0.000381  0.000251  0.000170  0.000118  0.000084
 0.000061  0.000045  0.000035  0.000027  0.000022  0.000018  0.000016  0.000014
 0.000012  0.000011  0.000010  0.000009  0.000008  0.000008  0.000007  0.000007
 0.000006  0.000006  0.000005  0.000005  0.000004  0.000003  0.000003  0.000002
 0.000001  0.000001  0.000000
22  0.259280  0.2962735E+01
 0.000003  0.000011  0.000022  0.000033  0.000045  0.000057  0.000071  0.000085
 0.000102  0.000120  0.000143  0.000170  0.000205  0.000253  0.000320  0.000423
 0.000586  0.000856  0.001345  0.002263  0.004014  0.007353  0.012990  0.019833
 0.024026  0.022184  0.016844  0.012038  0.009236  0.008194  0.008473  0.009963
 0.012528  0.015794  0.018545  0.019404  0.018195  0.016064  0.014424  0.014048
 0.015464  0.019018  0.024766  0.030508  0.031751  0.026722  0.019145  0.012976
 0.008785  0.006071  0.004241  0.002900  0.001938  0.001279  0.000836  0.000554
 0.000381  0.000270  0.000199  0.000152  0.000119  0.000094  0.000075  0.000061
 0.000049  0.000040  0.000033  0.000027  0.000023  0.000020  0.000018  0.000017
 0.000016  0.000015  0.000015  0.000015  0.000015  0.000015  0.000014  0.000014
 0.000014  0.000013  0.000012  0.000011  0.000010  0.000009  0.000007  0.000006
 0.000004  0.000002  0.000000
23  0.269040  0.2831411E+01
 0.000001  0.000004  0.000009  0.000013  0.000018  0.000024  0.000031  0.000039
 0.000048  0.000061  0.000077  0.000099  0.000129  0.000173  0.000236  0.000334
 0.000485  0.000731  0.001138  0.001838  0.003069  0.005173  0.008732  0.013646
 0.018889  0.021505  0.020236  0.016777  0.013533  0.011464  0.010589  0.010627
 0.011282  0.012227  0.012975  0.013191  0.012827  0.012220  0.011891  0.012376
 0.014373  0.018609  0.025990  0.034137  0.036886  0.030701  0.021476  0.014724
 0.011080  0.009082  0.007635  0.005976  0.004195  0.002587  0.001456  0.000780
 0.000413  0.000228  0.000133  0.000086  0.000060  0.000047  0.000040  0.000036
 0.000034  0.000033  0.000033  0.000033  0.000032  0.000031  0.000030  0.000029
 0.000028  0.000026  0.000025  0.000024  0.000023  0.000022  0.000020  0.000019
 0.000018  0.000017  0.000016  0.000014  0.000013  0.000011  0.000009  0.000007
 0.000005  0.000002  0.000001
24  0.278810  0.3222539E+01
 0.000001  0.000004  0.000007  0.000011  0.000016  0.000021  0.000028  0.000036
 0.000047  0.000062  0.000082  0.000112  0.000155  0.000221  0.000322  0.000477
 0.000722  0.001110  0.001750  0.002782  0.004498  0.007341  0.011896  0.018347
 0.024533  0.026265  0.022117  0.015874  0.010971  0.008268  0.007130  0.007153
 0.008207  0.010340  0.013173  0.015720  0.016627  0.015692  0.014180  0.013719
 0.015454  0.020499  0.028950  0.035811  0.032700  0.022842  0.014906  0.010993
 0.009520  0.008763  0.007403  0.005208  0.003008  0.001503  0.000728  0.000368
 0.000205  0.000131  0.000094  0.000076  0.000065  0.000057  0.000050  0.000042
 0.000035  0.000028  0.000022  0.000017  0.000014  0.000012  0.000011  0.000010
```

Figure D1. (Sheet 5 of 6)

```
 0.000010  0.000011  0.000012  0.000014  0.000016  0.000019  0.000023  0.000027
 0.000031  0.000036  0.000039  0.000041  0.000042  0.000040  0.000035  0.000029
 0.000020  0.000011  0.000003
25  0.288570  0.3297618E+01
 0.000001  0.000006  0.000011  0.000017  0.000023  0.000030  0.000037  0.000045
 0.000055  0.000068  0.000084  0.000105  0.000135  0.000178  0.000242  0.000341
 0.000496  0.000749  0.001167  0.001877  0.003084  0.005126  0.008458  0.013406
 0.019343  0.024001  0.024825  0.021891  0.017747  0.014343  0.012260  0.011394
 0.011542  0.012531  0.014138  0.015920  0.017288  0.017855  0.017836  0.017910
 0.018706  0.020384  0.022303  0.023061  0.021625  0.018638  0.015674  0.013497
 0.011727  0.009621  0.006986  0.004396  0.002461  0.001293  0.000682  0.000379
 0.000229  0.000152  0.000111  0.000087  0.000072  0.000060  0.000051  0.000043
 0.000037  0.000031  0.000027  0.000025  0.000024  0.000024  0.000025  0.000028
 0.000032  0.000038  0.000045  0.000052  0.000060  0.000068  0.000075  0.000079
 0.000080  0.000079  0.000075  0.000069  0.000061  0.000052  0.000042  0.000031
 0.000021  0.000010  0.000003
26  0.298340  0.3728810E+01
 0.000003  0.000012  0.000025  0.000037  0.000051  0.000066  0.000082  0.000100
 0.000120  0.000142  0.000166  0.000192  0.000220  0.000251  0.000290  0.000339
 0.000410  0.000527  0.000727  0.001102  0.001882  0.003534  0.007019  0.013498
 0.021040  0.023590  0.019002  0.013244  0.009955  0.009195  0.010487  0.013441
 0.017191  0.019722  0.020010  0.019125  0.019084  0.021008  0.024657  0.027371
 0.026254  0.022078  0.018706  0.018199  0.020536  0.022697  0.019907  0.012814
 0.006983  0.003840  0.002354  0.001639  0.001206  0.000864  0.000576  0.000352
 0.000203  0.000120  0.000076  0.000054  0.000045  0.000041  0.000041  0.000043
 0.000047  0.000050  0.000052  0.000054  0.000056  0.000061  0.000067  0.000077
 0.000090  0.000103  0.000114  0.000117  0.000111  0.000098  0.000082  0.000066
 0.000052  0.000041  0.000032  0.000025  0.000019  0.000015  0.000011  0.000008
 0.000005  0.000002  0.000001
27  0.308110  0.4226143E+01
 0.000002  0.000010  0.000019  0.000029  0.000040  0.000050  0.000061  0.000072
 0.000084  0.000097  0.000109  0.000123  0.000136  0.000149  0.000163  0.000180
 0.000203  0.000240  0.000305  0.000434  0.000712  0.001399  0.003362  0.009146
 0.023710  0.039697  0.033874  0.017305  0.008742  0.006068  0.006232  0.008464
 0.012541  0.016249  0.016480  0.013832  0.011599  0.011534  0.014684  0.022014
 0.031321  0.033385  0.027146  0.021508  0.020503  0.022209  0.021456  0.015411
 0.008482  0.004428  0.002530  0.001652  0.001197  0.000889  0.000646  0.000455
 0.000318  0.000234  0.000185  0.000159  0.000145  0.000136  0.000126  0.000115
 0.000103  0.000096  0.000095  0.000106  0.000133  0.000191  0.000292  0.000441
 0.000604  0.000690  0.000650  0.000521  0.000378  0.000262  0.000181  0.000127
 0.000091  0.000067  0.000051  0.000039  0.000030  0.000023  0.000017  0.000012
 0.000008  0.000004  0.000001
28  0.317870  0.4828044E+01
 0.000001  0.000005  0.000011  0.000016  0.000022  0.000029  0.000036  0.000045
 0.000056  0.000071  0.000090  0.000118  0.000156  0.000206  0.000272  0.000355
 0.000456  0.000583  0.000758  0.001037  0.001567  0.002752  0.005798  0.014080
 0.031104  0.042782  0.030945  0.015738  0.008946  0.007316  0.008537  0.011869
 0.015194  0.015012  0.011847  0.009237  0.008937  0.011942  0.019837  0.029410
 0.029026  0.020936  0.016643  0.019328  0.027996  0.030642  0.018586  0.007970
 0.003843  0.002666  0.002562  0.002750  0.002555  0.001767  0.000932  0.000439
 0.000221  0.000133  0.000100  0.000091  0.000094  0.000101  0.000110  0.000122
 0.000144  0.000188  0.000271  0.000402  0.000532  0.000543  0.000413  0.000253
 0.000142  0.000081  0.000050  0.000034  0.000025  0.000020  0.000017  0.000015
 0.000014  0.000012  0.000011  0.000010  0.000009  0.000008  0.000006  0.000005
 0.000003  0.000002  0.000000
```

Figure D1. (Sheet 6 of 6)

Appendix E
Notation

Text	Appendix C	
dd		Two-digit code for day
	DEPTH	Water depth
df		Frequency increment
$d\theta$		Direction increment
$D(f_n,\theta_m)$		Directional distribution function at frequency f_n and direction θ_m
	D(J)	J^{th} direction of a set of ND discrete directions
	DD(N,J)	Directional distribution function at frequency F(N) and direction D(J)
	DS(J)	Integrated direction spectral density at direction D(J)
	F(N)	N^{th} frequency of a set of NF discrete directions
FD		Frequency-direction
	FDS(N,J)	Frequency-direction spectral density at frequency F(N) and direction D(J)
FF		Formatted frequency-direction spectrum
f_n		n^{th} frequency of a set of N discrete frequencies

Text	Appendix C	
f_p		Peak frequency
$f_{p,FD}$		Frequency at peak of frequency-direction spectrum
$f_{p,IFS}$		Frequency at peak of integrated frequency spectrum
	FS(N)	Integrated frequency spectral density at frequency F(N)
	GPAT	Nine-digit code for pattern of operating gages
hh		Two-digit code for hour
hhmm		Four-digit code for time of day using *hh* for hour and *mm* for minute
H_{mo}		Characteristic wave height
$I(f_n,\theta_j)$		Cumulative distribution function at frequency f_n and direction θ_m
	IHM	Four-digit code for time of day
	IYMD	Six-digit code for date
j		Index associated with discrete direction
	J	Index associated with discrete direction
m		Index associated with discrete direction
M		Integer number of discrete directions
mm		Two-digit code for month or minute as dictated by context
n		Index associated with discrete frequency
	N	Index associated with discrete frequency
N		Integer number of discrete frequencies

	ND	Integer number of discrete directions
	NF	Integer number of discrete frequencies
$S(f_n)$		Integrated frequency spectral density at frequency f_n
$S(\theta_m)$		Integrated direction spectral density at direction θ_m
$S(f_n,\theta_m)$		Frequency-direction spectral density at frequency f_n and direction θ_m
T_p		Spectral peak period
$T_{p,FD}$		Spectral peak period from the frequency at which the frequency-direction spectrum is a maximum
$T_{p,IFS}$		Peak period from the integrated frequency spectrum
yy		Two-digit code for year
yymmdd		Six-digit code for date using *yy* for year, *mm* for month, and *dd* for day
$\Delta\theta$		Directional spread parameter
$\Delta\theta_n$		Directional spread parameter of a 180-deg directional distribution at frequency f_n
$\Delta\theta_{FDP}$		Directional spread parameter of the directional distribution at the peak frequency of a frequency-direction spectrum
$\Delta\theta_{IDS}$		Directional spread parameter of integrated direction spectrum
$\Delta\theta_{SW}$		Spectrally weighted directional spread parameter
θ_j		j^{th} direction of a set of M discrete directions

Text	Appendix C	
θ_m		m^{th} direction of a set of M discrete directions
θ_p		Peak direction
$\theta_{p,n}$		Direction of peak in directional distribution function at frequency f_n
$\theta_{p,FD}$		Direction at peak of frequency-direction spectrum
$\theta_{p,IDS}$		Direction at peak of integrated direction spectrum
$\theta_{p,SW}$		Spectrally weighted peak direction
$\theta_{25\%,n}$		Direction at which cumulative distribution function equals 0.25 at frequency f_n
$\theta_{50\%,n}$		Direction at which cumulative distribution function equals 0.50 at frequency f_n
$\theta_{75\%,n}$		Direction at which cumulative distribution function equals 0.75 at frequency f_n

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A multiyear series of wind wave frequency-direction spectral measurements has been undertaken at the Field Research Facility of the Coastal Engineering Research Center, U.S. Army Engineer Waterways Experiment Station. Cross-spectra of surface-corrected signals from a linear array of nine bottom-mounted pressure sensors have been used in conjunction with an iterative maximum likelihood algorithm to estimate frequency-direction spectra in about 8 m of water, approximately 900 m offshore. This report provides an index of and describes a means of access to 1,505 spectral observations obtained from September 1989 to August 1990. This period represents the fourth year of data collection. In addition to a list of data collection start times, a set of bulk parameters are provided to characterize the observations. Included are characteristic wave height, spectral peak frequency and corresponding peak period, peak wave direction, and directional spread. Time series graphs of these parameters, as well as local winds and currents, illustrate some of the salient climatology.

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